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PICKS and SHOVELS

By O. E. POTTER

Find the Man!

For years we've followed the "Personal" columns of the newspapers, poring over the "Please come home. All is forgiven" and "Will the nieces and nephews of a long-lost uncle from Australia please communicate, etc." items in the youthfully optimistic hope that we too might learn "something to our advantage." We never did, though.

However there is for us adventure and excitement in the "Personals" and reading them always arouses that feeling that there is something waiting just around the corner and all that sort of thing. All of which makes us very happy to have a "Personal" for our own modest column and nothing could give us more delight and that exalted feeling of being of use in the world than to discover through Picks and Shovels the man we're looking for.

He is one Lafayette Hickman who sometimes goes under the name of Jack Wilson and according to the latest information, he has been working on construction jobs in Pennsylvania and New York. When last heard from, he was working on a job in western New York, in 1929. He is about 52 years of age.

Now the reason we are assisting in the search for this man is that he has a sum of money waiting for him which if not claimed soon will go to others. And because that is a thrill we've never had, we should like to have a small share in passing along the news of this good fortune to said Mr. Hickman.

Will Mr. Hickman or Mr. Wilson or anyone who knows him and his whereabouts please write immediately to Picks and Shovels, Contractors and Engineers Monthly, 470 Fourth Ave., New York City, for the details which will, as the Personals say, be to his advantage.

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C. & E. M. Photo

Repairs on the Job

Arc Welding a Clamshell

Repairs on the job are becoming more and more common sights, because of the great saving in time and money effected by this method of meeting the emergencies which arise even on the best regulated jobs. The illustration above shows one of the clamshells on the George H. Flinn Corp. contract for a grit chamber at 110th Street, New York City, being repaired after handling a large quantity of rock on the west side of an excava-

(Continued on page 28)

Moving Missouri River 3,100 Feet Westward Near Omaha, Nebr.

(Photo on page 44)

South Omaha Toll Bridge Built Over Dry Land, While Jetties Are Built to Bring River to Bridge

WHEN the construction of the South Omaha toll bridge, sponsored by the City of Omaha to carry U. S. Route 75, was commenced in July, 1934, the contractor, the Kansas City Bridge Co. of Kansas City, Mo., had the unique experience, and distinct advantage, of constructing the two main spans, of 500 feet each, over dry land. The Missouri River Channel, now being stabilized under plans of the Corps of Engineers, U. S. Army, as a part of the comprehensive project for the improvement of the river from Kansas City to Sioux City, has not yet reached its eventual location under the navigation spans of the new bridge.

When the first work on the Kansas City to Sioux City project was begun in the vicinity of Omaha in 1932, the main channel of the river followed the Iowa shore from the Union Pacific railroad bridge to below the site of the new South Omaha Bridge. As this location did not correspond to the alignment fixed under the project, the construction of a series of dikes was begun to move the river bodily to its proper location along the Nebraska shore. The first system of dikes completed under contract by the Kansas City Bridge Co. has successfully regulated the river to a point immediately above the new bridge site. A second system of dikes constructed by C. F. Lytle,, of Sioux City, Iowa, under a contract let late in 1933, is continuing the regulation progressively downstream and is gradually moving the channel toward its final location under the constructed main spans of the new bridge.

In 1933 the channel was about 3,100 feet east of its final stabilized location. On May 1, 1936, the main thread of the channel had been moved westward 2,600 feet, with 500 feet yet to go to its final location. The west bank of the river on that date had reached the riverward pier of the second navigation span. The superstructure of the bridge has been continued over that portion of the river formerly used for navigation, and navigation now proceeds through the second main span of the bridge. The dikes which were designed to influence the the movement of the channel have been

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State Highway Safety Features in Washington

By LACEY V. MURROW,
Director of Highways,
State of Washington

(Photos on page 44)

THE safety and comfort of travel, without sacrificing the essential elements of appearance, rapid communication and service to traffic, have for many years past been a guiding factor in the design and construction of state highways in the State of Washington. Where traffic reaches a volume which can not be carried with reasonable safety on a two-lane pavement, studies and investigations have indicated the necessity of expanding the facility into a four-lane highway with the traffic moving in opposite directions separated by a neutral unpaved zone.

This neutral zone, 4 feet in width, is usually constructed with crushed stone, with or without a bituminous surface. This design provides for a width of 62 feet from shoulder to shoulder, consisting of the two 20-foot pavements, two 9-foot shoulders and the 4-foot neutral zone in the center. Where the cost is not prohibitive, the width of this neutral zone may well be increased to form a parkway.

Construction on this roadway design was first undertaken in 1924 on State Road No. 1 between Seattle and Tacoma when the grading work was started. Since that time construction of this type of road has been carried out on heavily-traveled portions of the state highways and at the present time there are more than 100 miles of such construction in the state.

A Neutral Zone Divides Double Lane Pavements and Sodium Vapor Light Effective Even in Fog

Neutral Zone a Mental Barrier

The neutral zone or strip has given excellent results from a safety standpoint. While vehicles may cross from one pavement to the other at ordinary speeds with safety, the tendency is to keep entirely clear from the center neutral strip and there have been no indications of a driver attempting to pass other vehicles by making use of the pavement used by the opposing traffic.

Observation and the records of the Washington State Patrol indicate that this type of construction is the safest design that has thus far been devised. This method costs very little more than the ordinary construction for the same number of traffic lanes and the expenditure is more than justified by the safety feature which is provided.

Largest Sodium Vapor Installation

The Department of Highways in the fall of 1935 constructed a sodium vapor lighting system along State Road No. 1 from the southern city limits of Tacoma south for a distance of 2.9 miles. This section of highway is subject to heavy fog and it has been found that the sodium vapor light would eliminate the hazard to driving under such conditions.

This installation, consisting of 66 units, is at the present time the largest of its kind in the United States. The lights used on this section of road, which

(Continued on page 36)

A 4-Foot Center Strip Between Two Double 10-Foot Lanes of Concrete Keeps Meandering Motorists in Line on Washington State Highways

Reports of Flood Damage

States in Flood Areas Make Plans for Repairs

Federal Aid and State Funds, WPA and Special Appropriations Called Upon to Meet Emergency

THE great flood of 1936 will very likely go down in history as one of the major catastrophes in New England, Pennsylvania, Ohio, Maryland and West Virginia where the damage rose into the millions. The State Highway Departments of these states have been straining all their resources and energies to repair the damage to state highways and bridges and to cooperate with towns and counties in order to restore the transportation facilities of those areas to normal.

While detailed plans for this restoration work are not yet available, a summary of the damage done by the flood and a general outline of the plan of procedure and the manner of financing this work follows.

The Damage in Maine

Maine suffered a very substantial loss in roads damaged and in bridges lost and damaged as a result of the severe flood conditions last March, reports Lucius D. Barrows, Chief Engineer of the Maine State Highway Commission. Heavy rainfall added to snow with high water content and a period of unseasonable warm weather were the contributing factors to the flood which was without precedent in the memory of most of the people now living in that section of the country.

The major and most serious damage was to the bridges, particularly along the Androscoggin, Kennebec and Saco Rivers and their tributaries and also to some extent along the Penobscot and Sebasticook Rivers. It is estimated that the replacement with modern bridges of all the structures involved would cost at least $4,500,000. However it will be necessary to make repairs and partial replacements where possible. While it is still impossible to make an exact estimate of the cost of this work, it is believed that it will cost between $2,500,000 and $3,000,000 to place these bridges in safe usable condition.

In Maine, all bridges on the state highway system are maintained by the state. On this system, only three bridges were lost or seriously damaged. These include a bridge 550 feet in length, over the Kennebec River in Waterville, two spans of which were completely lost; a wood bridge, 95 feet in length, on Route 126 in Gardiner over a tributary to the Kennebec River; and a steel bridge, 272 feet in length, over the Saco River between Biddeford and Saco on Route 5. In addition, a toll bridge over the Kennebec River between the towns of Richmond and Dresden was seriously damaged. This bridge was 1,250 feet in length and was owned and operated by the state. Three of the main spans were removed from the piers by the ice and several of the piers carried out or damaged.

About 240 bridges of all types, large and small, on all classes of roads have been reported damaged or lost. Of this number, 91 bridges have spans of 50 feet or over.

It is estimated that the damage to state and state-aid roads will not exceed $500,000. Repairs to these roads for the most part will be made by the state maintenance forces. Embankments have already been replaced at washouts on the

Washouts Such as This on Massachusetts Route 119 Required Prompt Attention From the State Maintenance Forces Throughout the Flood Areas

state highway system and the resurfacing will be done as soon as the work can be handled.

In Maine town roads are maintained entirely by the towns and include well

(Continued on page 10)

Rhode Island State Roads Were Saved by Dam; Town Roads Suffered but Greatest Damage Came from Frosts

By JOHN V. KEILY, Asst. Director of Public Works, State of Rhode Island

DAMAGE to Rhode Island state highways by flood water in March of this year was nominal. While many of the 725 miles of the state highway system were inundated 12 to 18 inches, the damage was limited to shoulder washouts on new fills on many roads recently constructed. Repairs will be made by state maintenance forces from the $150,000 emergency appropriation recently passed by the State Legislature.

In the Blackstone River valley north of Providence from Woonsocket to Pawtucket, flood conditions existed but state highways came through practically unscathed. On the other hand, town roads were seriously affected because of inadequate culverts and unstable surfaces.

The Scituate Reservoir of the newly completed Providence water supply served to check severe flood conditions on the north branch of the Pawtuxet River west of Providence. On the south branch of this river where less control existed there were flood conditions in the Norwood area and many families had to be moved out. In spite of this, there was no damage to the roads and bridges even where they were subjected to severe pounding.

A prayer of thankfulness went up from the people of northern Rhode Island when the Rice City Dam at Uxbridge, Mass., held after many reports of threatened failure. Had this dam gone out, the damage in the Blackstone valley between Woonsocket and Pawtucket would have been much worse.

Frost Damage

Thanks to heavy gravel sub-bases, varying from 6 to 12 inches in thickness under practically all state highways, frost damage was practically eliminated in spite of severe frost conditions during the past winter. With an 8-inch top and a 12-inch sub-base of gravel, frost had to penetrate 20 inches before it could do any possible damage and the drainage provided by the gravel sub-base properly tapped to adjacent ditches prevented water rising under the surface. There was some serious frost damage, however, on old secondary roads which had been maintained solely with surface treatment and did not have adequate subgrade treatment over poor soils.

The frost also caused considerable damage on about 10 miles of open-type cold-mix bituminous surfacing on a concrete base. This damage has been progressive over several seasons, causing serious disintegration.

Mileage of Highways

In the state of Rhode Island there are 113.28 miles of gravel roads, 88.38 miles of waterbound macadam, 162.66 miles of cement concrete, 248.05 miles of bituminous macadam, 17.65 miles of bituminous concrete with coarse aggregate, 63.44 miles of bituminous concrete with graded aggregate, and 31.35 miles of bituminous surface on concrete base, making a total of 724.81 miles.

Concreting Trestles Another "Biggest Ever" at Grand Coulee Dam

By HENRY W. YOUNG

M. H. SLOCUM, General Superintendent for the Mason-Walsh-Atkinson-Kier Co., contractors on the present development at Grand Coulee dam, remarked:

"Grand Coulee is far too big for any one man to keep an accurate picture in his mind of all the details. The only way to look at it is as a series of independent jobs. Almost every feature of the work is a big job in itself, in fact more than likely to be the biggest thing of its kind ever undertaken.

"Suppose," he continued, "you take that steel trestle in the west side cofferdam. It represents only a section of the complete trestle which will ultimately extend clear across the river, over 3,000 feet. Looking at it even as a bridge job, it is a big one—9,500 tons of steel. Looking at it as a means for transporting and placing concrete, and eventually to be buried as it stands in the core of the dam, you can understand that nothing similar was ever before undertaken on such a scale."

In line with Mr. Slocum's statement, Grand Coulee is also now far beyond the point where it can be covered by any one article. It is only possible to take here and there a detail, and even that must be handled rather sketchily. The trestle itself, or rather, pair of trestles, and the function they perform, represent one of these details and an attempt is made to give a few highlights concerning them.

Trestles, High and Low

The high trestle is on the up-stream side of the dam. The low trestle beyond is about over the draft tubes of the west side power house location, or near the toe of the dam. The trestle construction so far extends only about half way across the west side cofferdam area, or

Trestles for West Side Cofferdam Containing 9,500 Tons of Steel Speed Pouring of Blocks

approximately 933 feet. Eventually, it will extend across the whole area, that of the spillway and over the east side area. The total length will then be 3,088 feet for the up-stream trestle and 3,000 feet for the down-stream one. In the present trestle construction, the highest bent is 195 feet above bed rock on the up-stream side and 120 feet on the down-stream side. These heights will permit the completion of the dam up to the extent of the present contract. As the work progresses, all the steel of the trestles is to be buried in the concrete. Since this is a gravity type dam, the steel so buried performs no particular function, but there is no way of salvaging it at a cost commensurate with its salvage value.

The height of the structure is such that when the contract is completed, the deck of the trestle will be above the contract line. The whole deck is bolted up with turn bolts which permit its being re-erected at a higher elevation should that be deemed desirable on the succeeding contract. The deck on the low trestle, however, which will eventually be flooded, will be removed by the present contractor and used on the other side of the river.

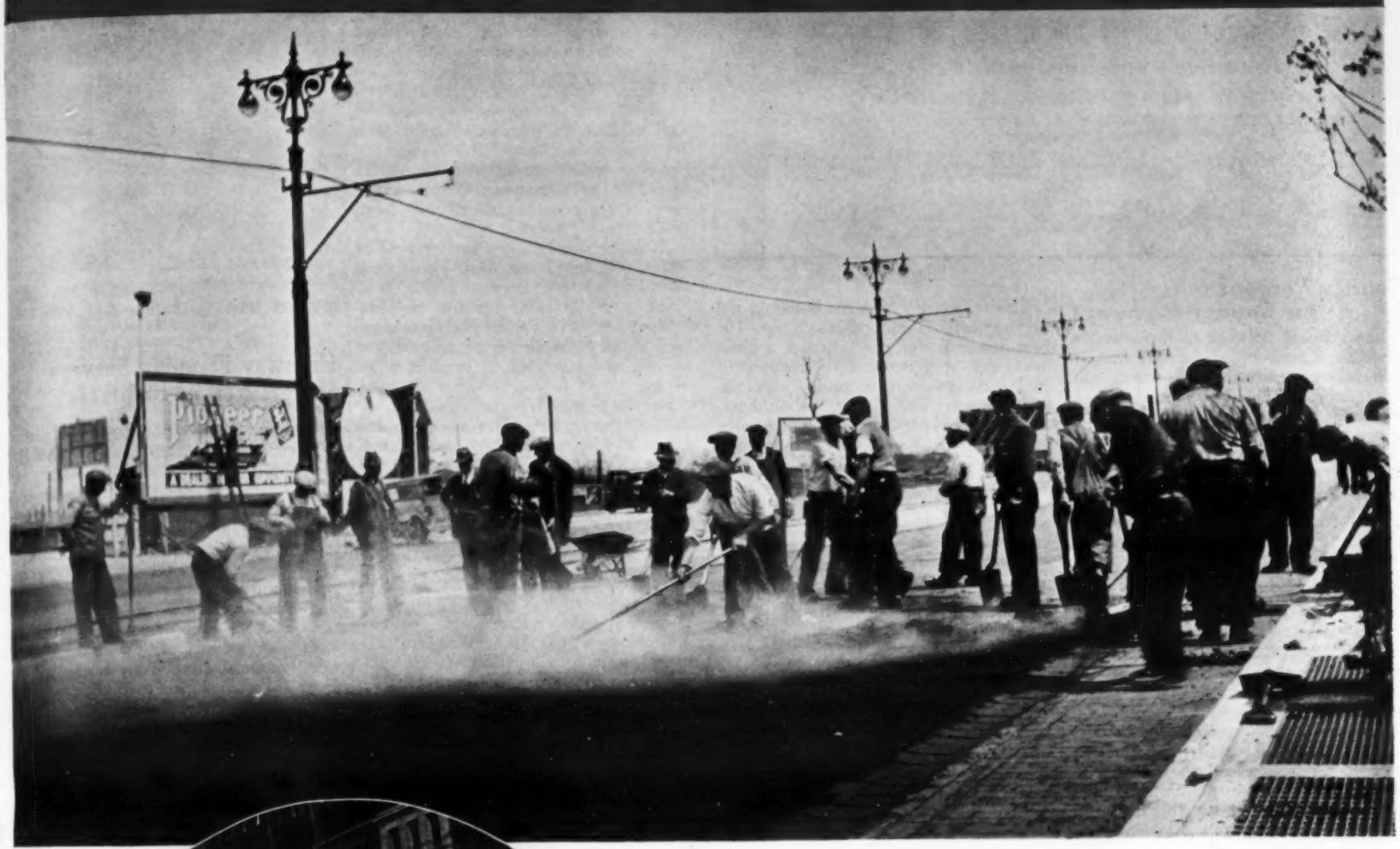
Construction of Trestles

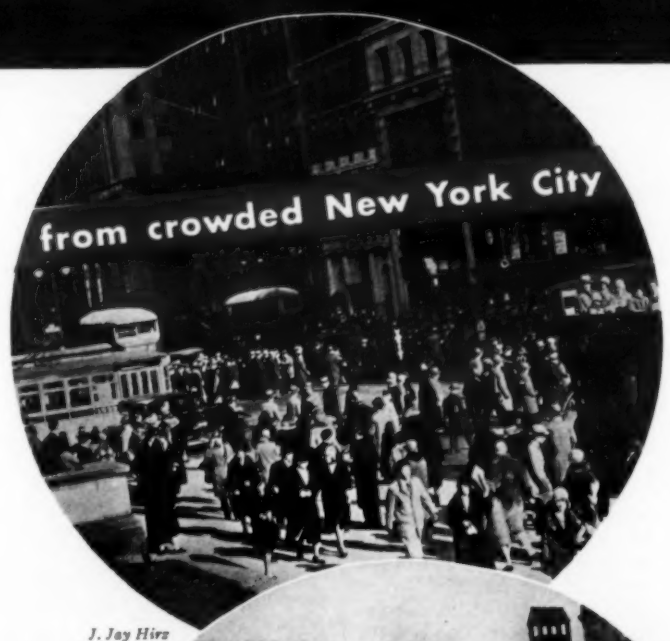
As to the construction of the trestle itself, this was not the work of an imported crew of bridge builders. All

(Continued on page 17)

General View of the West Side Cofferdam Area, With the Concrete Batching and Mixing Plant in the Foreground, and the Trestles for Conveying Concrete to the Blocks in the Dam.

PAVING PART OF A MAIN OUTLET





J. Jay Hirz

Queens Boulevard in the Borough of Queens, New York City, is one of America's most heavily-traveled thoroughfares.

Traffic flows steadily over Queens Boulevard all the year around, but on summer week-ends and holidays, particularly, the Boulevard is practically hidden beneath cars headed for Long Island's beaches and parks.

TEXACO Sheet Asphalt has been constructed this year on a large portion of Queens Boulevard. New York City knows from more than a quarter-century of experience that it can count on this type of heavy-duty TEXACO Asphalt construction for many years of service and an attractively low bill for repairs.

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County Responsibility for County Highways

The primary network of highways in any state is made up of the state routes; then follows the secondary system under county or township control. In a few states all local road work has been turned over to the state highway departments. This is a mistake because taxpayers in general feel that the larger the governmental unit responsible for any work, the more money can be expended for each unit of activity. Because of this strange psychological feeling which is best exemplified by the present attitude of "let the Federal Government do it, Uncle Sam has lots of money," taxpayers demand unwarranted high types of highway surfaces for secondary roads when the state foots the bill, but the same people are perfectly satisfied with an economically justified type of improved surface if it is financed and built by the county.

There are some sections where, because of the sparse population, one county is not financially able to support an adequate county highway department. In cases such as these, there is no reason why two or more counties should not unite in employing a county engineer or surveyor who has training and background in highway technology.

In counties where well-trained engineers and surveyors are regularly placed in charge of county highway construction and maintenance, the commissioners are to be congratulated on their sense of civic responsibility. Unfortunately, there are still too many cases where the opposite is the case. These are typified by the following quotation from a county surveyor's letter, one of many received discussing this problem:

"The county roads here are administered by our County Commissioners. As the county was without engineering services for about twenty years, except for the necessary right-of-way surveys, the value of engineering and proper road maintenance has never been demonstrated. As the administration of the county road funds serves as an excuse for the Commissioners to pile up time and mileage, there is little prospect of a change."

The taxpayers want roads today, not mileage bills from Commissioners. The best argument for re-election as a Commissioner is a network of economical improved roads connecting with the state routes. The taxpayer should not be left stranded 4 miles from a pike or state road, he should be put on a county road that will serve him 366 days this year.

To our readers who conscientiously administer their share of the hundreds of thousands of miles of county roads our message is "Carry on," to those who need encouragement to do a better job for the county our hope is that they will appoint a real road man for the engineer or surveyor and back him up in his work to produce more and better service roads for all.

Do We Need More Roads And Better Roads?

The year 1960 will find about 43 per cent more motor vehicles traveling the roads of the United States, according to a recent survey by Committees of the American Petroleum Institute. The 22,400,000 passenger vehicles registered in 1935 would increase about 39 per cent in number to 31,100,000 and the 3,600,000 motor trucks would increase in number to 6,000,000. The total registration for 1960 is estimated at 37,100,000 as compared with 26,000,000 for 1935.

If we are going to operate 43 per cent more motor vehicles over the highways of the United States and at the same time reduce the deaths from motor vehicle accidents, we must have more and safer highways; not forgetting the intensive program of education directed at prospective and newly licensed drivers. The day is not far distant when we shall remove the relatively slow truck traffic from main roads used for passenger vehicles and send them through from city to city on special highways built for them alone. This inevitably will result in a reduction in accidents because a large percentage of the fatalities are caused by drivers "cutting around."

Airplanes Aid Road Safety Campaign in England

Airplanes are to be used for what is believed to be the first time in a road safety campaign in Great Britain when, according to a recent announcement by the Automobile Association, reported by the U. S. Bureau of Foreign and Domestic Commerce, its intensive safe-driving campaign will use air craft to advertise the need for careful driving.

The launching of the campaign and the employment of aerial publicity is timed to coincide with the heavy traffic movement out of London and other large towns toward seashore resorts. The air craft will be equipped with large sky sheets some 1,800 feet in area, carrying the message "Road Users—Give Way and Be Safe" in letters 12 feet high.

The planes will operate chiefly over the South Coast resorts for the time being but if this experiment in aerial publicity is found to be a success, it is likely that it will be extended to other important seaside resorts.

Famous Austrian Highway To Be Made Dustless

During the summer season of 1936 the Grossglockner Alpine Highway in Austria will be improved by constructing an additional parking place and by surface treating 54 per cent of the highway with dust preventives. The total expenditure for this work will be about $241,000.

The completion of this highway in 1935 was one of the outstanding highway events of Europe.

Facts and Figures About Grand Coulee

A huge electric shovel weighs somewhat more than an ordinary pin, but both have their places in the building of a great project like Grand Coulee Dam, states a recent issue of the *Columbian*, published by the Mason-Walsh-Atkinson-Kier Co., contractors at Grand Coulee. The difference in weight is that of 275,000 pounds opposed to a fraction of an ounce, but almost every possible weight in between is represented by the thousands of articles necessary in the construction of this huge project.

A modest estimate for timber used is 10,000,000 board feet plus. This figure includes such large items as 2,000,000 in block 40; 1,200,000 for the railroad bridge; 1,000,000 for the west cofferdam and 552,000 for the east; and 91,000 for the poles needed to conduct electricity.

For the west cofferdam 12,600 tons of sheet piling or 121 miles of steel were used; 30 McKiernan-Terry steam hammers; about 4,500 tanks each of acetylene and oxygen and about 1½ miles of steam hose. And the cofferdam is but one part of the project.

The three water storage tanks on the hillside have a capacity of 350,000 gallons; the cement silos, 50,000 barrels; on the railroad bridge, 6,000 machine bolts with nuts and washers; for the west conveyor, 2,000 6-inch rollers and 10,000 bearings; for the chutes and hoppers at the screening plant, 240,000 pounds of steel; for the upstream and downstream construction trestles, ultimately 9,000 tons of steel. To go further with figures, the job has required 113 miles of cable; 385,000 pounds of electric wire; six compressors; 400 electric motors; 13 excavating shovels; 20 buggies; two 2,500 pumps; 10 diesel-electric engines for the pouring of the concrete; and 10,000 pencils of all descriptions.

Road Building Policies Discussed by MacDonald

In discussing the policies in highway administration before a recent transportation conference at the U. S. Chamber of Commerce, Thomas H. MacDonald, Chief, U. S. Bureau of Public Roads, said:

"There is, and has been, a tremendous pressure upon public officials for surfacing for motor vehicles a larger and larger mileage of our public highways. This pressure has resulted in a large relative and actual increase in the mileage of the so-called low-type roadways. This statement is not intended to be critical, except to the extent that design and cost of these low-cost roads have been forced below reasonably economical standards. The danger in this policy lies in the certain rapid increase of maintenance costs and the exclusion of necessary new construction.

"The policy here expressed of extending the mileage of new construction has been brought about by transferring large mileages, in some cases the total public road mileage within the state, to the jurisdiction of the state, without an equivalent transfer of funds.

"Both of these policies, placing an enlarged commitment against the state highway funds, have been simultaneous with a diversion to other than highway purposes of income from the special taxes on road users.

"All of these policies are tending to destroy the logical and necessary stage construction policy which was adopted by practically all of the states, by utilizing funds which should go to replace and to bring to more adequate standards the roads which have received the first stage improvement."

Courtesy of The New Yorker and Robert J. Day

"You'll Have to Excuse Me. I'm All Thumbs Today."

Highway Planning Surveys Undertaken by 32 States

Comprehensive highway planning surveys conducted by state highway departments, with the advice and guidance of the U. S. Bureau of Public Roads, are under way or about to be undertaken by 32 states, in the belief that the completed studies will point the way for the development of long-term highway programs and tax reduction.

These projects will include an inventory of every mile of passable road in each state, a study of the character and extent of traffic on the various roads, and a careful examination of highway costs, expenditures and revenues. The factors of capital cost, road life and maintenance cost will also be considered.

To cover the costs of the survey there will be available in each state 1½ per cent of the following funds, as apportioned to that state: the 1935 Public Works Fund as provided under the Hayden-Cartwright Act; the 1936 fiscal Federal Aid apportionments; and the Works Progress Administration Highway and Grade Crossing apportionments. In addition to these funds the states must match the monies of the Federal-Aid funds used. A number of states have already arranged for separate WPA projects, some of which have been approved.

It is expected that the survey will cover a full year. Analysis of the records, maps, and other data accumulated is expected to take another year. The results of the survey and the analyses made will be developed into a report which will carefully evaluate and outline the complete highway picture. This program will substitute an acceptance of a perpetual and continuing obligation of maintenance and rebuilding when necessary for the present casual treatment of roads, year by year, with annual demands and appropriations.

Recommendation on Vitrified Paving Brick Revised

The Simplified Practice Recommendation on the varieties and sizes of vitrified paving brick is up for revision, following a meeting of the Permanent Committee which proposed the following change: 1. The elimination of the 2½-inch x 4-inch x 8½-inch plain wire-cut brick (vertical fiber lugless); and 2. The elimination of the 3-inch x 4-inch x 8½-inch plain wire-cut brick (vertical fiber lugless). The four recognized varieties remaining in the Simplified Practice Recommendation represent 79.3 per cent of the total sales of vitrified brick.

G. F. Schlesinger, Chief Engineer and Managing Director of the National Paving Brick Association, analyzed a detailed survey which has been compiled to show the character of shipments of brick made during 1935, which survey was the basis for the action taken by the Standing Committee.

Old State Route Made Into Easy-Riding Road

(Photos on page 44)

STATE Route 48, the Dayton-Lebanon-Cincinnati, Ohio, road had been in none too good repair for several years and was too narrow for the heavy traffic that used it. To the east it had been paved with concrete and became a very popular highway. The State Department of Highways awarded a contract to the Republic Asphalt Paving Co. of Dayton, Ohio, for the resurfacing of a section of this road 3 miles in length, using hot-mix hot-laid. The work called for a waterbound widening and leveling course for the new 20-foot pavement and then a 1½-inch surface course.

The Plant that Republic Built

The hot-mix plant built by Republic Asphalt Paving Co. in Dayton has been responsible for many miles of state highway and city paving material over the last decade. It is located in the northwest section of Dayton on a B & O spur track. The aggregates are furnished by the National Lime & Stone Co. of Lima, Ohio, and are shipped in by rail. The plant has been redesigned in the last two years to conform to the changed state highway department specifications. Formerly the aggregates were unloaded behind barricades and fed to the drier through gates to the bucket elevators. At present the aggregates are unloaded by a Thew steam crane with a 42-foot boom and 1-yard Lakewood clamshell bucket to a 3-compartment bin of 21-tons capacity over a Columbus reciprocating apron feeder. The feature of this feeder is that it is possible to feed all three of the aggregates at the same time and to change the proportions at will or to cut out any one or two of the aggregates by an adjustment of the feeder plates. This machine makes it possible to do away with the second bucket elevator and the attendant formerly needed.

Sand for the mix is applied by the Moraine Sand Co. of Dayton which delivers it to the plant by truck, dumping to a stockpile from which it is picked up and fed to the hopper by the Thew crane. The asphalt plant, a Cummer unit with a 1-ton mixer box, consists of the single cold-material bucket elevator delivering the aggregates to the drier and thence by hot elevator to the screens and hot bin storage. The screens separate the material into four screen sizes. The entire plant is electrically driven, while the asphalt pump, asphalt bucket and mixing box are heated by steam from a boiler operated 24 hours a day and over the weekend so that the plant is ready for instant operation every week-day morning.

The crew for running the plant consists of the crane operator, one oiler for the plant, a day and night engineer for the boilers, one man on the reciprocating feeder, one weighman on asphalt and another on aggregates. The asphalt weighman dumps the mix after the 15 seconds dry mix and 60 seconds mix with the A.C.

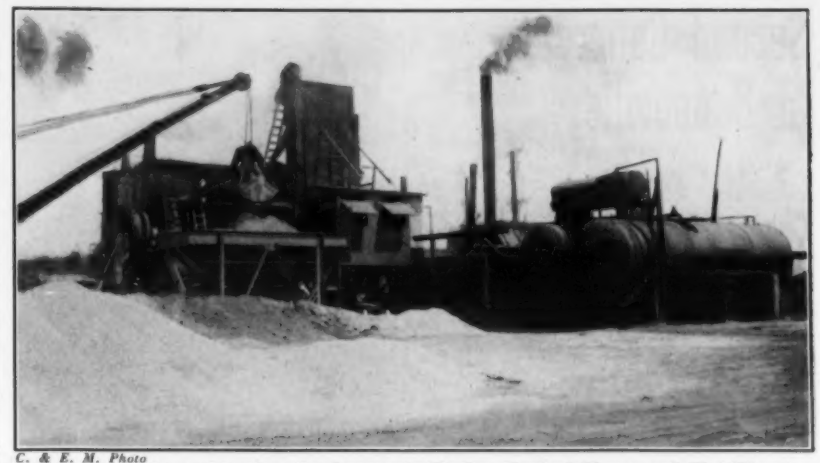
The asphalt weigh bucket is steam-jacketed and the asphalt is sprayed into the mixer through a series of nozzles. A Howe dial scale is used to indicate the weights of the aggregates and the asphalt weight is shown on a separate scale. The time of mix is regulated by a General Electric timing device.

The contractor uses Texaco asphalt which is delivered in tank cars from Lawrenceville, Ill., and pumped to two 10,000-gallon storage tanks. The same pump picks up the asphalt from these tanks and delivers it to the weigh bucket. The hot batches are dumped directly into the batch trucks with no intermediate storage.

Dayton, Ohio, Contractor Resurfaced 3 Miles of Tar-Bound Macadam with Hot-Mix, Hot-Laid

On this job the trucks received seven 1,500-pound batches of top or binder as required before pulling out. When the required number of batches had been delivered to the truck, the mixer man blew a whistle to inform the truck driver to pull out. He pulled clear into the yard and covered his truck with a heavy tarpaulin and then "high-balled" for the job 14 miles away. A fleet of eight trucks with insulated beds did the hauling.

The weights of the material in the binder and top courses were:



C. & E. M. Photo

The Hot-Mix Plant Showing the Aggregate Feeder, Control House and Hot Elevator and Bins, and the Asphalt Storage Tanks

Binder Course, per Batch	
Sand (3/16-inch)	420 lbs.
No. 2 stone (½-in., retained on 3/16-in. screen)	580 lbs.
No. 3 stone (1-in., retained on ½-in. screen)	418 lbs.
Asphalt	82 lbs.
Top Course, per Batch	
Sand (3/16-inch)	600 lbs.
No. 2 stone (½-in., retained on 3/16-in. screen)	792 lbs.
Asphalt	108 lbs.

Widening and Leveling Course

Crushed limestone was used for the waterbound widening and leveling course. It was hauled 20 miles and delivered by the Laura Sand & Gravel Co.

(Continued on page 27)

You need this DOUBLE CROWDING POWER in Tough Digging

By dead-ending the hoist cable on the inner or upper end of the dipper sticks and not on the boom the force in the end of the hoist cable, *wasted on all other shovels* is made available for *extra* digging and crowding power.

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NORTHWEST ENGINEERING COMPANY

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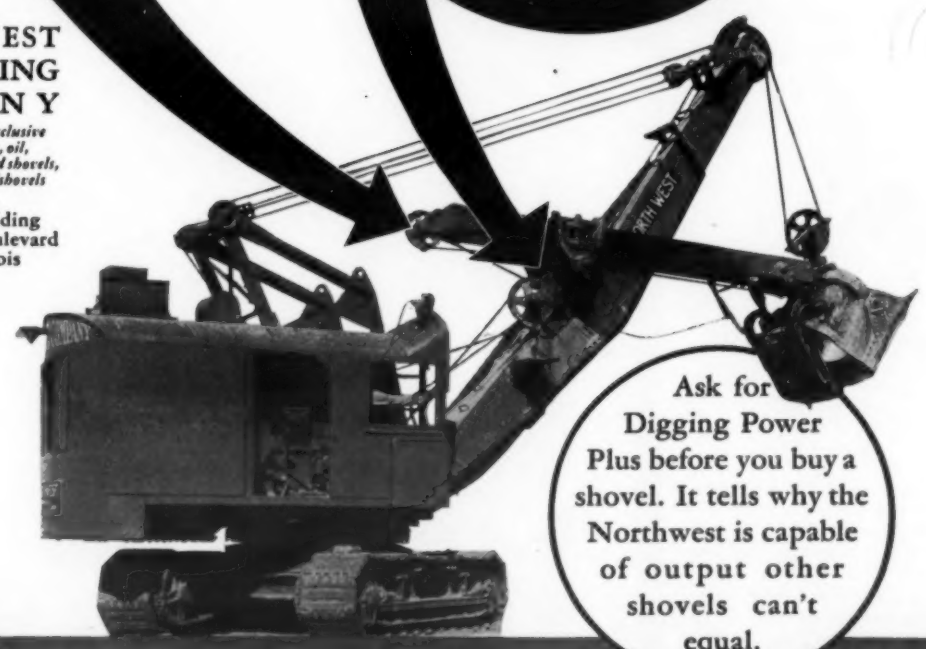

Ask for Digging Power Plus before you buy a shovel. It tells why the Northwest is capable of output other shovels can't equal.

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NORTHWEST

GASOLINE, OIL
DIESEL OR
ELECTRIC
POWERED

BUILT IN A RANGE OF 15 SIZES — 3/8 YD. CAPACITY AND LARGER

Second Cofferdam at Bonneville

Columbia Construction Co. Used Cribs Tailored to Fit Contour of Irregular River Bottom

IN spite of almost unprecedented weather and ice conditions during the month of February, the Columbia Construction Co. has made good progress on the north cofferdam construction since January 1. Shore crib No. 22 has been placed and the outer steel sheet piling driven on the up-stream leg and two others going down adjoining it. Next to the shore on the down-stream side two others were in place early in March.

As in the case of the south side cofferdam, the cribs are built with "tailored" bottoms to fit the contour of the river bottom. This contour is determined from a great number of equally spaced soundings, which are plotted to give a definite picture of the bottom composed of ledges and boulders. These soundings are then checked up to a week, or even less, of the time each crib is sunk. Any changes of boulders after the original soundings are noted on the chart and compensated for.

Placing the Cribs

The construction of each crib is started in a bulkhead at the shore line, which opens upstream for floating the crib out after the bottom has been constructed. There is a platform in the bulkhead composed of transverse I-beam stringers and longitudinal I-beam girders. Blocking is then laid up on the platform, of varying heights representing the contour of the river bottom. Upon this blocking, the bottom members of the crib are laid and the timber work continued on up to the point when it is desired to float the crib.

The I-beam platform is supported on two sides by a series of steel cables operating on five-ply pulley sheeves, the hoisting engine being located about 100 yards from the bulkhead. When a crib bottom is completed, the platform is lowered and the crib floated out into still water in front of the bulkhead, ready to be towed to its destination.

The cribs are built of 12 x 12-inch main timbers, with 8 x 12-inch verticals,

Tailor-Made Crib, Started on Piles of Blocks of Various Heights Supported on a Platform Barely Submerged

fastened together with ¾-inch machine bolts and drift bolts. In each crib are four weight pockets, each 7 feet 11 inches square in the clear, arranged symmetrically around the center. These chambers have solid bottoms of 12 x 12's. When the cribs are in place to be sunk, the chambers are filled with rock and as the structure goes down it is added to at the top until the crib rests on the bottom.

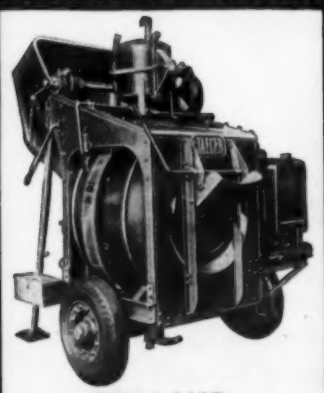
This calls for painstaking work when the swiftness of the current is taken into account and the fact that the outer cribs will some of them be nearly 70 feet in height, from approximately — 33 feet to + 33 feet.

The cribs on the up-stream leg of the cofferdam are 40x60 feet in cross section and those on the mid-stream side and down-stream leg are 60 feet square. The steel sheet piling on the water side of the cribs is driven to 3 to 4-foot penetration. After the piling is driven, a clay foundation seal or impervious blanket will be placed on the bottom and banked up around the base of the piling as well as a backing fill on the inside.

Westinghouse Offices Move

The Westinghouse Electric & Mfg. Co., Westinghouse Electric International Co. and Westinghouse Lamp Co. have announced the removal of their New York executive and sales offices to the Westinghouse Building, 150 Broadway, New York City.

BUYING A MIXER?



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- Machined Steel Tracks,
- 2 Wheel Mounting with Timkens and Pneumatics,
- End Discharge Advantages,
- Man-Ten Alloy Steel,

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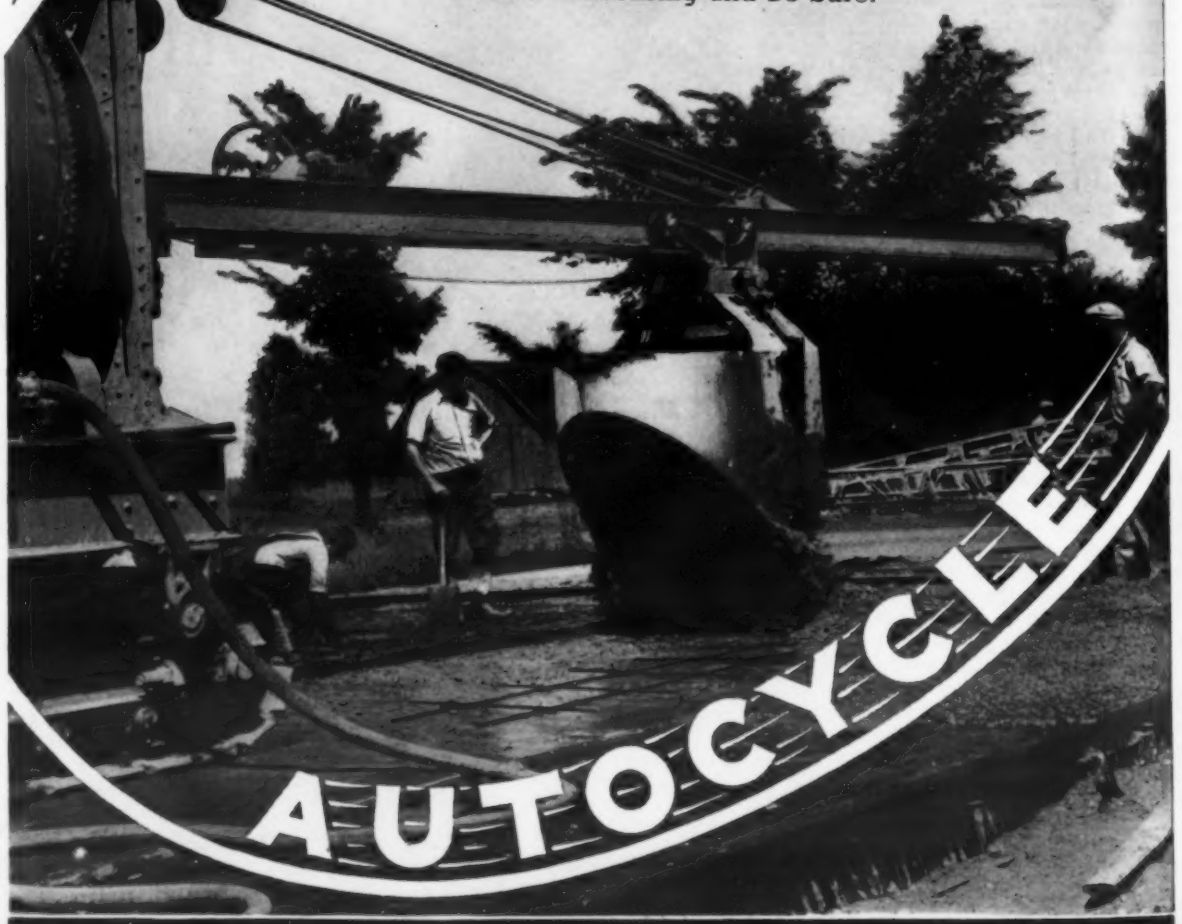

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Missouri River Moved Westward

(Continued from page 1)

completed, and nothing remains to be done except to permit nature to take its course and continue the erosion of the west bank until the entire river passes beneath the two main spans of the bridge. It is conservatively estimated that the main thread of the channel will not reach its final location in less than three years, although failure to do so will not in any way impede navigation. When the channel finally arrives in its permanent position it will be held there by revetting the Nebraska banks.

Typical Dike Construction

Permeable pile dikes and bank protection revetment form the chief weapons of the Corps of Engineers to contract and stabilize the channel, prevent erosions and build up eroded banks. These dikes are composed of groups or "clumps" of piles at variable spacing held together with stringers of piles. The dikes have much the effect as snow fences in breaking the current, thereby causing settlement of silt which results in a fill of sufficient height to form new bank levees. Mattresses of lumber or willow are used chiefly to prevent erosion.

Bank or spur dikes are those which extend directly out from the bank of the river either at right angles or at any variable angle. Trail dikes are those taking off of the bank dikes, and other shorter dikes leading from trail dikes are known as "spur from a trail" dikes. The other general type is the longitudinal dike which runs along the shore line and is used to protect a bank likely to be eroded.

Lumber Mattresses

Lumber mattresses were used exclusively on the Lytle contract. They are used to protect bank dikes from underscour, the pile clumps being driven through the mattress, for the protection of longitudinal dikes and for straight revetment. The mattress is begun at the shore end by fastening three thicknesses of 1 x 4-inch boards of not less than 10-foot lengths together to form the bottom half of the header clamp. The header clamp length is usually 105 feet which requires butt jointing of the boards with the joints broken. The three layers of boards are lashed and nailed together every 3 feet with ⅜-inch cable and 20d nails. On top of this half of the header clamp, weavers are laid at right angles to the header clamp and nailed with 10d nails. On top of the weavers and parallel to the header clamp, a spacer board is nailed to the header clamp at each weaver intersection with 10d nails. At right angles to the header clamp and directly over each weaver two thicknesses of boards, called top boards, are fastened with 20d nails to the spacer board. The top half of the header board is made like the bottom and spiked to the top boards with 40d nails at each intersection.

The main body of the mattress is woven parallel to the header clamp in courses spaced 4 inches apart. Each weaver intersection is secured at intersections with a 10d nail. Weaver boards are spliced 18 inches and nailed. At the outer end of each mattress are cribs built up of the weaver boards to retain stone for holding the edges in place.

Building Bank Dike of Clump Piles

When a bank dike is to be constructed the first operation is the driving of temporary anchor piles to guide the mattress when it is sunk in place. The mattress is built up as described above and sunk in place and the piles of the bank dike driven through it. Then starting at the bank, groups or "clumps" of three piles are driven with the clump spacing about 18 feet. On this contract the clump dikes were "3-row" with the adjacent rows of clumps staggered but close enough so that the rows could be lashed to stringers between each adjacent row.

The penetration of the piles is 20 to 35 feet, and the piles which are furnished to the contractor by the government measure 13½ inches minimum diameter 3 feet from the butt, and 9 inches at the tip. The tops of the piles after driving and cut-off are about 2 feet below the average bank. Each three piles in a clump are pulled together by a power winch and secured with seven turns of ⅜-inch steel cable, each turn being fastened with two boat spikes driven on opposite sides of the clump and with the spikes driven 4½ inches into the pile. The remaining part of the 6-inch spike is bent over the strand and forced down into the pile.

In driving piles jetting is used to give adequate penetration of the piles except for the last 4 feet which is driven only with the pile hammer.

C. & E. M. Photo

The Seven-Turn Lashing of a Pile Clump and Three-Turn Lashing of a Stringer

A pile stringer is run between each adjacent row of either single or clump pile dikes and lashed 3 feet below the top of the pile with ⅜-inch strand. To make the stringers continuous throughout the length of a dike they are lapped 6 feet by placing the large end of one over the small end of the adjoining stringer. The lap is always at a clump and so located that 3 feet of the lap extends on either side of the center line of the clump or single pile. Each end of the lap is fastened with three turns of ⅜-inch strand, the stringers are fastened to the contact pile of each clump or pile with three turns of ⅜-inch strand and the strand ends are fastened with at least two boat spikes. The strands are likewise fastened to the contact pile at top and bottom.

The outer ends of clump-pile bank dikes consist of terminals of 9 to 36 piles in 3 to 12 clumps securely lashed.

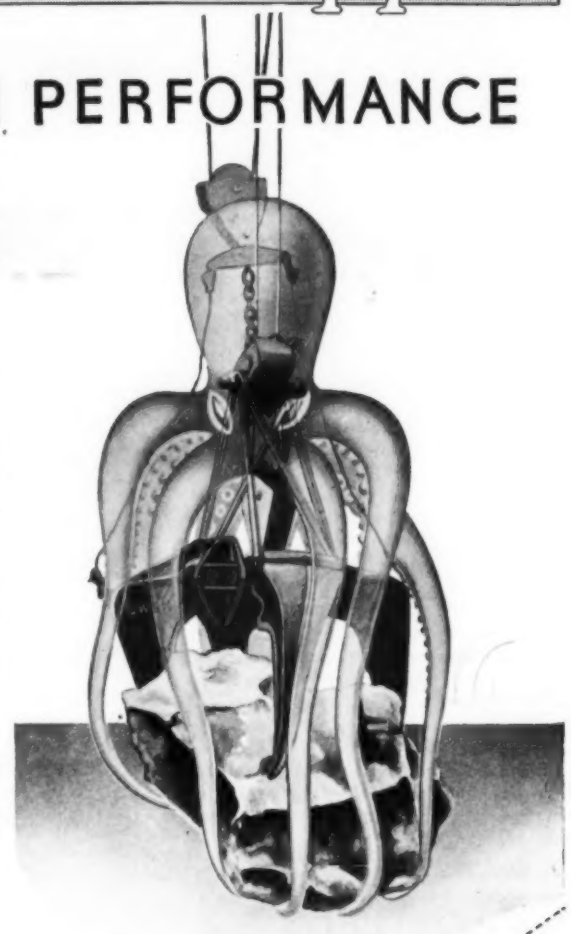
Stone Riprap and Dike Protection

At the shore end of each bank dike the bank is graded on a 3 to 1 slope

(Continued on page 25)

Announcing THE NEW Owen Grapple

revolutionary in PRINCIPLE and PERFORMANCE



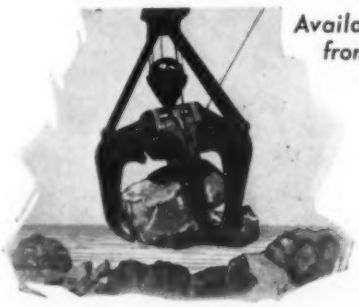
THIS NEW OWEN GRAPPLE has 4 independently operating tines each of which firmly grasps the rock, regardless of its shape.

Like an octopus, it *cunningly entwines its victim —exerts super-human strength* and *clings with inescapable tenacity.*

Numbers of these grapples have already proved their exceptional ability in *easier handling, increased capacity* and *greater safety of operation.*

Read our new illustrated, descriptive bulletin and you will clearly understand why this new grapple measures up to Owen standards which demand "a bigger days work."

Mail the coupon for grapple literature or folder describing the advanced line of Owen Buckets which now assure an even larger "MOUTHFUL AT EVERY BITE."



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Address _____ City _____

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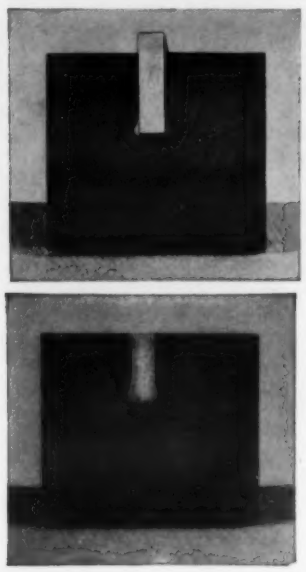
and an even larger MOUTHFUL AT EVERY BITE *in* Owen Buckets



Above, Section of Mitco Flooring Showing Cross Bar Before Pressing. Below, Section Showing Cross Bar After Pressing

Pressure-Formed Panels of Open Steel Flooring

A type of open steel flooring which is used for subway grating, in power plants, and on bridges has been developed by the Hendrick Mfg. Co., Carbondale, Pa. This Mitco open steel flooring is not a bolted or riveted grating; nor is it a welded grating. Mitco panels are pressure-formed without the use of mechanical locking devices. Carefully selected square edge steel bars of definite chemical and physical properties are used. The bearing bars are prepared with a dovetail to receive the cross or transverse bars. Under hundreds of tons of hydraulic pressure, the transverse bars are pressed into the bearing bars so that the metal in the transverse bars completely fills the dovetails in the bearing bars.

As the dovetails in the bearing bars are always above the neutral axis and are completely filled by the transverse bars, the strength of the full section is developed. The transverse bars, extending below the neutral axis, not only serve as struts but also provide transverse strength, firmly locking the panel into an integral unit, distributing concentrated loads over the entire panel and preventing lateral deflection.

These panels give maximum light and ventilation and do not retain dirt or refuse because only square edge bars are used, the panel surfaces are level and they have a high rating from the standpoint of non-slipping and non-clogging surface.

Literature describing and illustrating Mitco flooring may be secured from the manufacturer by mentioning this magazine.

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EXTRACTORS
HOISTS — DERRICKS
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Minn. Reports $2,000,000 Damage to Its Roads

Minnesota's trunk highway system suffered abnormal damage of more than $2,000,000 this spring as an aftermath of the unusually severe winter, according to figures submitted to Highway Commissioner N. W. Elsberg by maintenance engineers of the state highway department. This total does not include damage to bridges in recent spring floods nor the abnormal expense incurred in plowing snow off the roads this year.

Total abnormal expenditures and road and bridge damage resulting from unusual weather conditions since January 1 this year approximate more than $3,000,000, listed as follows:

Damage to gravel roads	$1,116,000
Bituminous-treated gravel roads	905,000
Shoulders, slopes and ditches	110,000
Bridges and culverts	200,000
Abnormal snow removal expense	750,000

This situation, combined with reduced maintenance funds resulting from lowered automobile license fees, creates a serious situation for the trunk highway system. As Federal funds can not be used for maintenance work, expenditures are limited in this field to available state revenues.

"Minnesota's experience with the weather this year should be sufficient proof of the danger in cutting down highway revenues below a reasonable margin of safety," Mr. Elsberg said. "After abnormal cold and snow in the winter, we experienced a spring cloudburst in the southern part of the state. Such contingencies must be provided for or our trunk highway system can not be satisfactorily maintained."

Three Pamphlets on Asphalt Road Construction

Construction specifications for the asphalt surface treatment of waterbound surfaces, specifications for the asphalt surface treatment of loosely bonded surfaces, and specifications for patching, reducing crown and correcting profile of old surfaces which are to serve as foundations are contained in three new pamphlets, S-2, S-3 and B-6 respectively, recently issued by the Asphalt Institute, 801 Second Ave., New York City.

The new pamphlets are a part of the series on Construction Specifications of the various types of asphaltic roads issued by the Institute from time to time, copies of which may be secured without charge from the Asphalt Institute.

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2" to 8"
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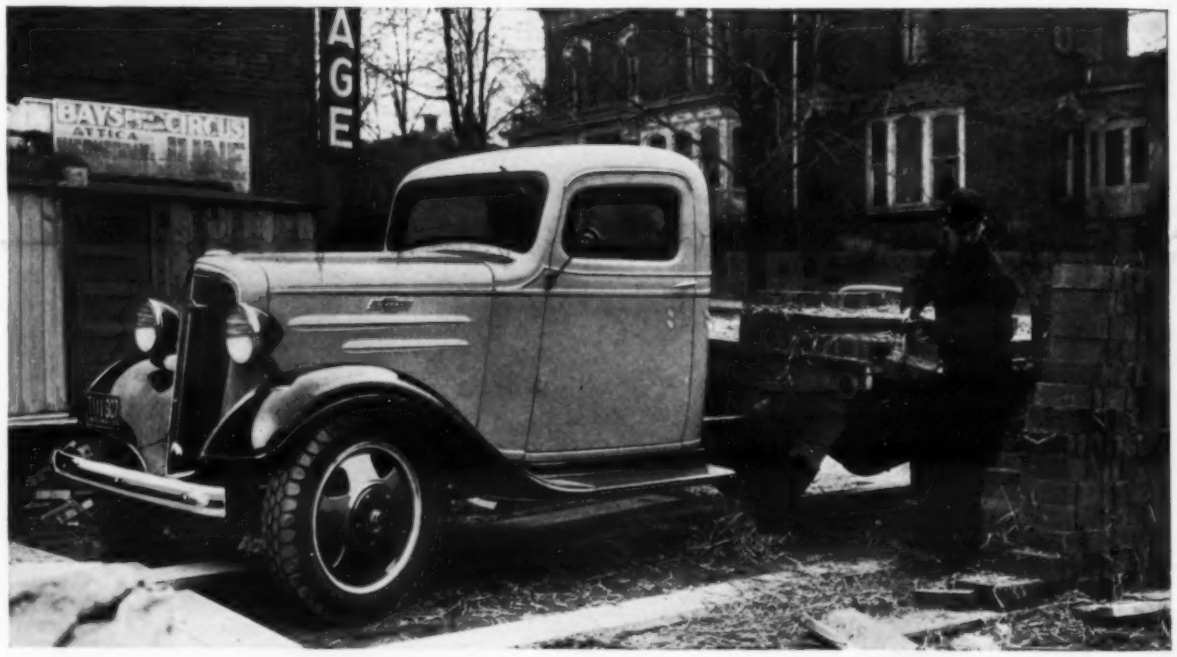

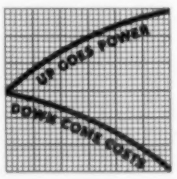

Contractors and builders engaged in all kinds of construction work are replacing costlier truck equipment with *powerful, low-priced* Chevrolet trucks!

New Chevrolet trucks, with the *greatest pulling power* of any trucks in the entire low-price range, have ample power for the heavier hauls, *plus* plenty of reserve power for emergency loads.

Lower investment and more flexible, faster service are only a part of Chevrolet truck economies. Chevrolet's High-Compression Valve-in-Head Engine has an unmatched record for big gasoline mileage and low oil consumption. New Perfected Hydraulic Brakes, a massive Full-Floating Rear Axle and rugged 4-Speed Transmission are all designed and built to give dependable, economical service—with *lowest* maintenance costs.

Inspect these new Chevrolet trucks! Ask your Chevrolet dealer for a trial demonstration on your own haulage jobs.

CHEVROLET MOTOR COMPANY, DETROIT, MICHIGAN

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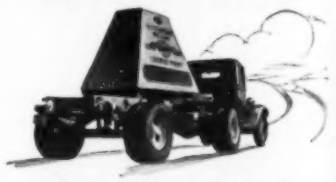
CHEVROLET TRUCKS
prove stamina and record-breaking economy in amazing coast-to-coast run



Look at this great record

Location of Test	Los Angeles to New York
Distance Traveled	3511.5 miles
Running Time	129 hours, 24 minutes
Average Speed	27.14 miles per hour
Gasoline Used	308.6 gallons
Gasoline, miles per gallon	11.378
Oil Consumption	2 quarts
Cost of Fuel	$7.59
Cost of Oil	$.67
Fuel and Oil (cost per mile)	$.016
Average cost per ton mile	$.00328
Water Consumption	1 gallon

No mechanical failures

Entire test conducted under supervision of A.A.A. Contest Board—Sanction No. 3300.

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Huge Bridge Span Hoisted 55 Feet

The 2,200-Ton Vertical Lift Span of Triborough Bridge, New York, Was Raised Into Place from Barge in Unusual Engineering Feat

(Photo on page 44)

BEFORE an audience of wide-eyed and astonished spectators, the 2,200-ton 310-foot vertical lift span of the Triborough Bridge connecting East 125th Street with Randall's Island, New York City, was floated into position on a barge, and then hoisted the 55 feet from the river to its position in the structure in 16 minutes. Not only is this the largest lift span ever installed but it was also the first time any such bridge span was completely finished and then hoisted into position.

Four tugs moved the railroad barge bearing the span into place, then two cross-pieces were lowered from the towers and bolted to the ends of the span. To the cross-pieces were fastened the 96 steel cables, each 2¼ inches thick, by which the span was raised. These cables extended over pulleys at the top of the towers and were attached to two concrete counterweights, weighing 1,000 tons each, which furnished the motive power for raising the span.

Suspending Span on Cables

When the bolting was completed, the gradual operation of transferring the weight of the span from the supporting car floats to the cables began. Three factors aided in this: first, the dropping of the tide gradually lowered the car boats; jacks at the tops of the towers were brought into use, slowly tightening the cables; finally, water was pumped into the floats by a fireboat to lower them and make the cable taut more quickly.

Within 15 minutes from the time water was pumped into the floats, the weight of the span was largely supported by the cables and the engineers began checking details while waiting for the ebb tide.

Hoisting Begins

When the water level was 3 feet 1 inch below high tide, hoisting was begun. Four steam engines supplied the power which supplemented the counterweights. The 50-foot vertical trip was made in three hauls. John Grandin, Superintendent of construction, directed proceedings from the top of the superstructure by means of a megaphone connected to a loud-speaker system throughout the bridge. By-standers asserted that his voice could be heard thirty blocks away.

Three times hoisting was stopped to level off, and then resumed. The normal height of the span will be 55 feet above the river but it was lifted 65 feet in order that the end panels which will rest on the 50-foot concrete bases could be attached.

When operating, the span will be lifted in 2 minutes from the 55-foot level to 135 feet by electric motors for ships which require that head-room.

Personnel

Jacob Lowenstein, President of the Taylor-Fichter Steel Construction Co., contractor for the steel erection on the bridge, devised the method by which this span was put in position. Colonel Harold W. Hudson is Engineer of Construction for the Triborough Bridge Authority.

New 5-Ton Motor Truck

A new Mack truck, known as Model EH, has recently been announced by Mack Trucks, Inc., 25 Broadway, New York City. This new model is offered in standard wheelbase lengths of 146 and 158 inches for the truck and 139 inches for the tractor chassis, with optional lengths at extra cost. The gross weight of 18,000 pounds is distributed approximately 30 per cent front and 70 per cent rear by means of the set-back front axle design, the front axle being but 74 inches ahead of the rear of the cab.

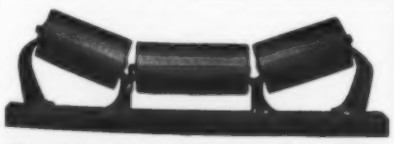
Model EH is powered by the 6-cylinder Model BG engine with a 3⅝-inch bore by 5-inch stroke which develops 79 hp at a governed speed of 2,300 rpm. Among the features of this engine are the case-hardened fully-counterbalanced crankshaft; drop-forged case-hardened nickel steel timing gears with generator-ground helical teeth; Mack Permafit exhaust valve seat inserts; Stabl-ite exhaust valves of austenitic steel to prevent distortion at high temperatures; offset turbulence type combustion chambers which permit high compression without detonation; radiused cylinder bores to prevent cracked cylinders between the bore and the valve deck; and cold-circulation type thermostatic temperature control to promote rapid warming of the cylinders.

Drive is from the dry single-plate clutch through a five-speed unit-with-

The Mack Model EH Truck Chassis

engine transmission, with direct drive in fifth as standard, an overgeared fifth being available at slight extra cost. Rear axle is of the single reduction spiral-bevel type. The four-wheel brakes on this model are of the hydraulic type and are vacuum booster actuated.

The cab is styled in the modern manner, with an all-metal roof built integral with the cab. Safety glass is standard equipment. The chassis frame is 8½ inches deep, ¼-inch thick and has a 3¼-inch flange. It is staunchly braced by three pressed steel deep-flanged box girder cross members with alligator jaw attachment to the side members, and two channel cross members.



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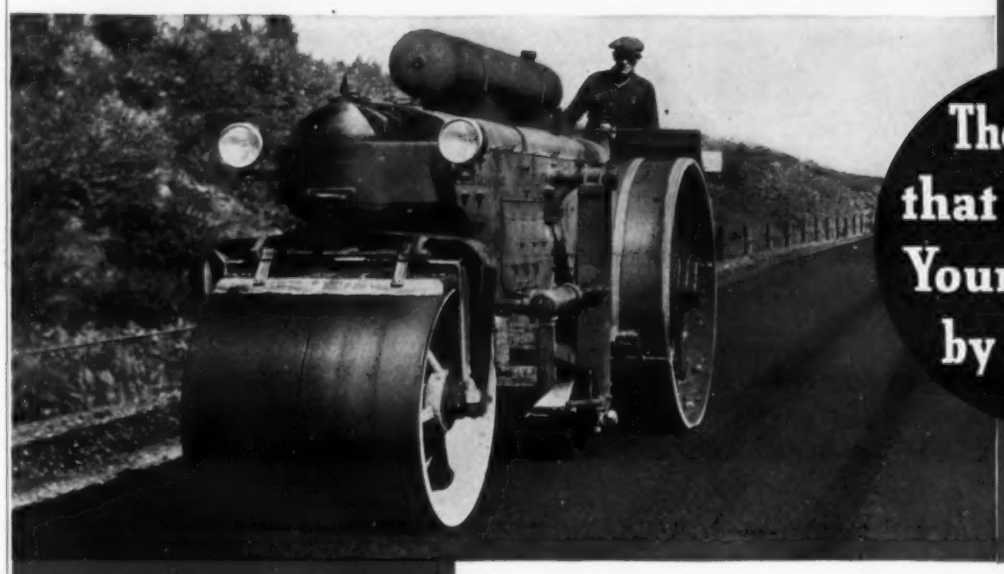
Roll-A-Plane



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● Its "spot pressure" center roll creates *unequalled pavement stability—straight-edge smoothness in one-third less time.*

These are the major reasons for the swing towards the Austin-Western Roll-A-Plane. As more and more contractors and engineers see it and learn its value in operation, the significance of its simple yet revolutionary principle with its possibilities for extra profit becomes obvious.

Uneven pavement is brought to grade in a fraction of the time formerly required since the center roll, acting as a moving straight-edge, finds and reduces the high spots.

Not only that—the kneading action of the small diameter center roll causes the aggregate to key more closely than is possible with large diameter conventional rollers, giving the finished highway a resistance to traffic action which will add years to normal life while reducing the cost of maintenance.

Austin-Western conceived the idea of the Roll-A-Plane, tested and perfected it for every kind of road rolling. Such developments are to be expected from the company that makes the world's most complete line of road building machinery.

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Tell me more about the Roll-A-Plane.
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Reports of Damage to Roads by Flood

(Continued from page 2)

over half the road mileage of the state. As yet, there has been no estimate of the amount of damage done to these roads but it is safe to say that it has been large. The WPA Administrator is cooperating with towns in repairing many of the roads included in this class and the State Highway Commission is cooperating as much as possible in the loan of equipment and engineering service where required.

To provide for the reconstruction and repair of bridges, the Commission has been holding conferences with WPA officials and town officers in order to establish in each case a basis of contribution by the agencies concerned. It has also presented a formal application to the WPA for eight bridge projects, involving a total cost of about $500,000, to be sponsored by the Commission. In many cases where the bridges are small and can be handled on a day labor basis with local crews, it is probable that the WPA will undertake to proceed with the work, in which case the projects will without doubt be sponsored by the local community. It is hoped that cooperation of WPA with the towns and the state will result in the reconstruction of the town bridges and roads.

New Hampshire's Plans

The damage to state highways and bridges in New Hampshire is estimated at approximately $1,700,000, confined for the most part to the Connecticut and Merrimack River valleys and their tributaries, reports Frederic E. Everett, Commissioner. The damage to the Federal-Aid system of highways is about $300,000 and about $200,000 to the bridges.

These repairs can be financed in part with special Federal-Aid funds to be matched with an equal amount of state funds. State maintenance funds have been and will be used for financing the smaller washouts and repairs. All the bridge work which is the larger part of the total expense will have to be financed from the state's reconstruction fund or by a special fund provided by the Legislature.

The damage to town highways and bridges is considerably greater than the damage to the state highway system, and may be estimated at about $3,500,000. The State Highway Department recommended that all towns apply for WPA aid in restoring and replacing damaged highways and bridges and assisted the towns in preparing estimates for this purpose.

Southern Half of Vermont Hit

The greater part of the damage in Vermont which, according to the best estimates of H. E. Sargent, Commissioner of Highways, is about $1,006,185, occurred in the southern half of the state.

On the state highways, the work of

River Ice Usurped the Right-of-Way in Several States. Clearing Route 112 Near Huntington, Mass.

repairing the damage was started by state maintenance forces as soon as the waters receded, using the regular maintenance funds. State-Aid funds were apportioned to the towns to help repair damage to their highways and bridges. Applications were also made to the WPA for funds for this work.

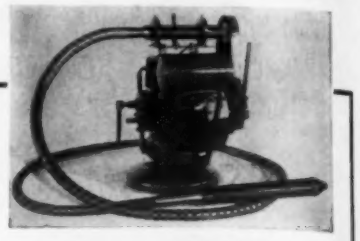
Mass. Legislature Votes Funds

A statewide summary of the flood damage in Massachusetts, furnished by G. H. Delano, Chief Engineer of the Massachusetts Department of Public Works, shows that the damage to state highways amounted to $1,897,300 and to state highway bridges, $167,700, making a total of $2,065,000. The total damage to highways and bridges of towns and cities is $13,294,000, of which $3,504,000 was to the roads and $9,790,000 to bridges.

The method of financing the flood repair work on the state highway system will be by a special act of the Legislature, authorizing a special appropriation of $450,000 to be taken from the Highway Fund for the construction of temporary bridges across the Connecticut River and by a special appropriation of $2,000,000 for repairs to highways and bridges. It is anticipated that some of this money will be used as a "Sponsor's Contribution" in conjunction with WPA funds.

The flood conditions were severe during two periods from March 11 to 15 and from March 19 to 22. The first flood period was most severe in the Connecticut Valley region and in the western and south central parts of the State.

(Continued on page 23)



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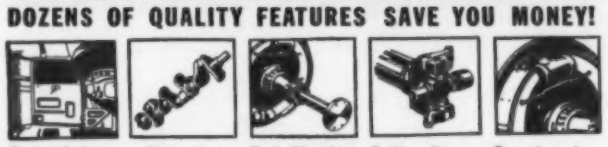

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An Outline of Practice for Bituminous Retreads

Best Methods for Pre-Mix and Mixed-in-Place Work Prepared Specially for County Road Officials

By OTTO S. HESS,
Engineer-Manager, Kent County Road Commission, Grand Rapids, Mich.

A BITUMINOUS retread is any bituminous surface of 3 inches or less in thickness which is placed over an existing base such as gravel, stone or an old bituminous surface. This type is usually used for the purpose of smoothing up and correcting faults in an old bituminous surface or for covering an existing gravel or stone base to furnish a better road at a lower annual maintenance cost. Retreads are distinctly low-cost surfaces and should practically never be considered otherwise. There are two general types of retreads; namely, pre-mix and mixed-in-place.

Pre-Mix Retreads

For pre-mix retreads the material is always mixed in a plant of some kind and hauled and placed on the road after mixing. The particular mix used may be any variation of bituminous mixes which have proved successful as road surfaces. The pre-mix method has some advantages over the mixed-in-place type but at the same time involves some disadvantages under certain conditions.

Pre-mix permits more accurate measurement and assures better mixing of materials. This operation, however, usually increases the cost considerably over that of mixed-in-place surfaces of the same thickness. The pre-mix may be either hot or cold but is usually a cold mix as the construction operations involved are ordinarily less expensive with cold material. When making a cold mix it is necessary to use bituminous materials that are liquid at ordinary summer temperatures or else cut back the bituminous material with a solvent that will keep it in liquid condition for a sufficient length of time to permit the necessary construction operations before it sets up.

Pre-mix jobs are usually of good quality but require more care and hence a higher cost to obtain smooth driving surfaces than with mixed-in-place types. With pre-mixes some type of finishing machine should be used but this necessarily adds somewhat to the cost of construction.

Mixed-in-Place Retreads

In building mixed-in-place retreads it is possible to use many different kinds of bituminous materials and aggregates. The particular type to be used in any certain case is largely a question of what is the most economical in the particular location. A bituminous material that will remain liquid at ordinary summer temperatures during the process of construction must be used for this type of road work.

If a gravel base is being surfaced, it is important that it be thoroughly compacted and sufficiently well shaped and smooth to furnish riding qualities which are comparable to the riding qualities desired in the finished surface. It is also imperative that the base be free from weak spots caused by poor drainage, capillary soils, etc. The retread is only a wearing course and cannot be expected to make up for deficiencies in the load-carrying capacity of the base.

The bituminous materials used in mixed-in-place retreads are tar, asphaltic oil, cut-back asphalt, or asphalt emulsion. All of these types have been successful under certain conditions and the methods of construction vary to some extent with each type.

Important Details in Construction

In nearly all cases it is advisable to prime the gravel base with ¼ to 1/3-gallon per square yard of light bituminous material. The aggregate is then placed on this surface and the bituminous material applied by a distributor on top of the aggregate. This is immediately followed by the mixing process which may be carried out with any one of several successful retread machines which are on the market today. Those most commonly used are the multiple blade

(Continued on page 19)

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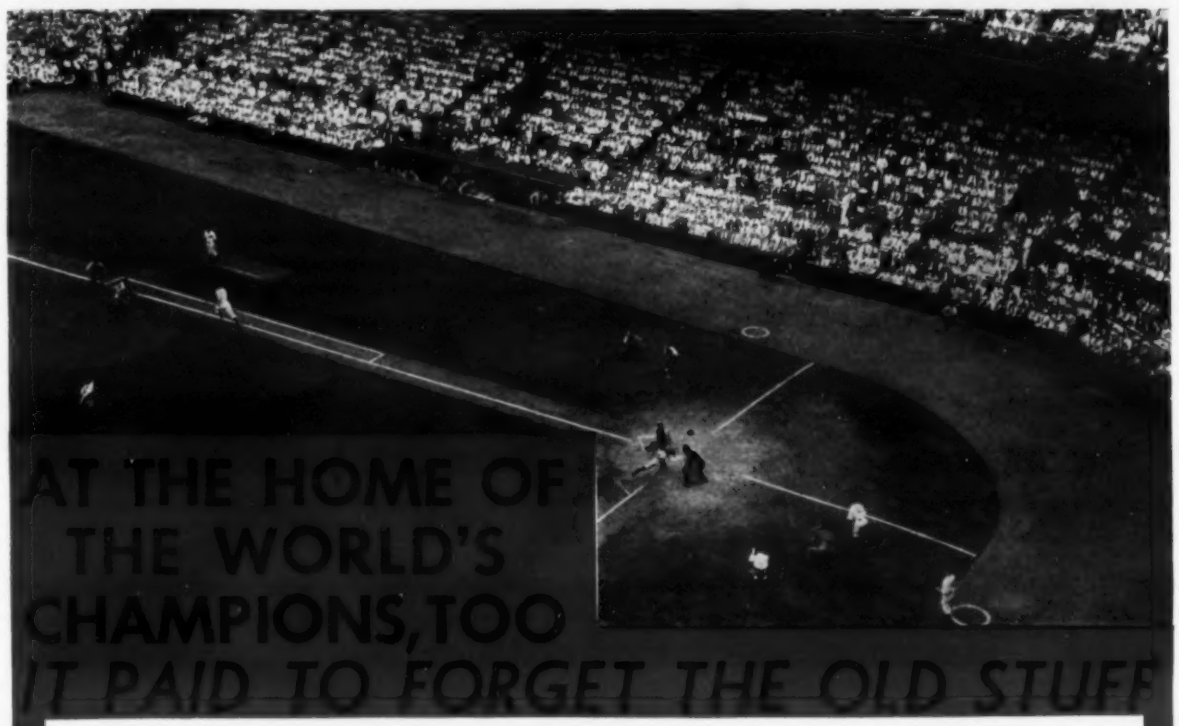

● Just as those Detroit Tigers dashed through the American League to a World's Championship, the contractors who rebuilt Navin Field, Detroit, also played "head's up" ball.

They Forgot the Old Stuff.

In the zero weather of Detroit's winter, so that the park would be ready for opening day, 40,000 yards of concrete was placed with the Rex Pumpcrete—one of the new standard tools of the construction industry.

Equipment that is already owned, methods of the years before are often the drag that brings too high costs on modern construction jobs.

In 1936, before you buy, before you bid, investigate the up-to-date methods of handling concrete.

CHAIN BELT COMPANY, 1666 West Bruce Street, Milwaukee, Wisconsin

The Rock Crusher Powergun Installed Inside the Cab of the Bucyrus-Monighan for High-Pressure Lubrication

Lubrication Installation For Canal Digger

Lubrication efficiency and convenience played a large part in a recently completed canal-widening project at Blue Island, Illinois, where a giant Bucyrus-Monighan dragline was put to work excavating tons of rock and clay for 3 miles along the canal bank. The job was handled by Morrison-Knudsen, Inc., well-known western contractors, and their equipment was kept on the job and in running order by the use of a well-planned lubrication installation.

In the shovel cab was mounted an Alemite air-operated Rock Crusher powergun. With a lubricant delivery of from 12 to 18 ounces per minute at air pressures of from 150 to 200 pounds, the powergun utilized only a portion of the machine's air supply, the rest being kept in check by an air regulator.

Four outlets were used in this installation in order to simplify the lubrication of the many Alemite fittings on the machine, there being 150 fittings on the outside rollers alone. One of the inside outlets, for example, consisted of a 20-foot hose line, complete with a control valve and whip-end hose. The lubricating end of the whip-end hose was equipped with a pull-on Buttonhead coupling to permit a leak-proof seal during lubrication. The other end had a coupling and check valve.

The lubricant being maintained in the line under pressure at all times, the operator had merely to make a quick connection of the whip-end hose between the fitting to be lubricated and the fitting in the line shut-off valve, then open the valve. Thus the simple operation of the control valve gave finger-tip control over tons of pressure for flushing all the worn grease out of the bearing and shooting fresh lubricant in.

To disconnect the hose and use it on another outlet, the line shut-off valve is closed, the pressure in the hose released, and another fitting or two given shots of the remaining lubricant. The hose can then be removed easily. The other outlets on the dragline installation were similarly equipped, the outside fittings being reached via a pipe which extended through the cabin wall.

Alemite Rock Crushers, air or electric-operated, are designed particularly to meet the demands of heavy-duty jobs like the Morrison-Knudsen machine.

Lubricating the Outside Rollers of the Dragline. Note the Pipe Through the Cabin Wall.

Their construction is simple, providing easy access to moving parts and requiring little attention. The powergun used on the Morrison-Knudsen job proved itself to be an important factor in shaving maintenance costs. For with correct, adequate lubrication to keep the big dragline's bearings in A-1 condition, repairs were held down even under the terrific strain of the record-breaking winter.

The efficiency provided by the handy, practical, four-outlet installation minimized waste and saved lubricant, and both the lubrication equipment and the excavator gave excellent service under the severest operating conditions.

U. S. Equipment for Roads in Guatemala

Highway communication in Guatemala was considerably improved during 1935 by the opening of new earth roads, the construction of a few permanent bridges, and improved maintenance of trunk line highways.

The carrying out of these improvements was made possible by the purchase of road building equipment by the Guatemalan Government from the United States amounting to $120,000, according to the U. S. Bureau of Foreign and Domestic Commerce.

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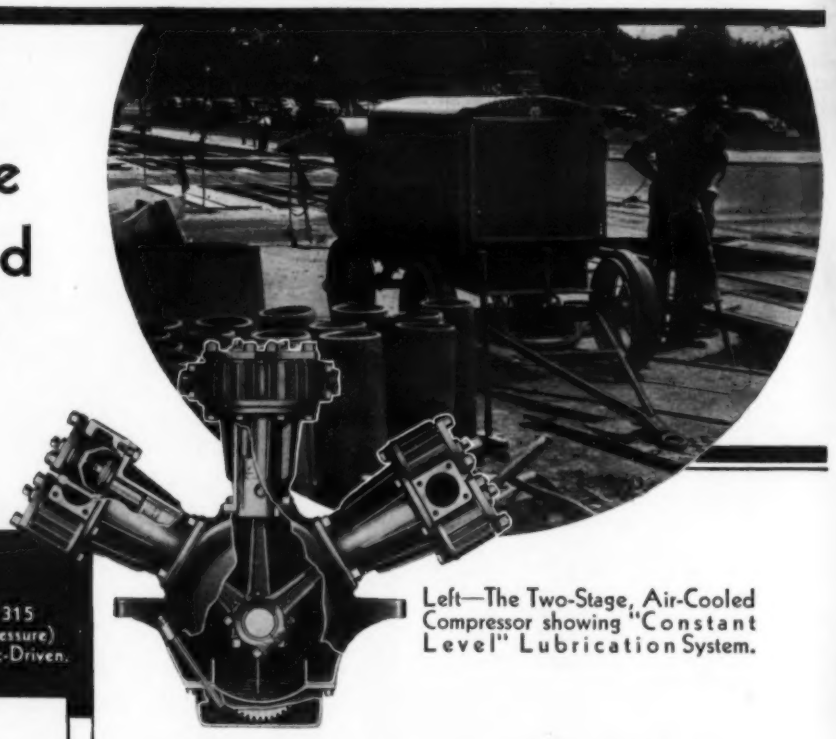

Left—The Two-Stage, Air-Cooled Compressor showing "Constant Level" Lubrication System.

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(Actual capacity at 100-lbs. pressure)
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With the "Constant Level" Lubrication System, available only in the I-R Two-Stage, Air-Cooled Portable, the compressor will be properly lubricated as long as there is oil in the crankcase. There is nothing to break, wear, or clog.

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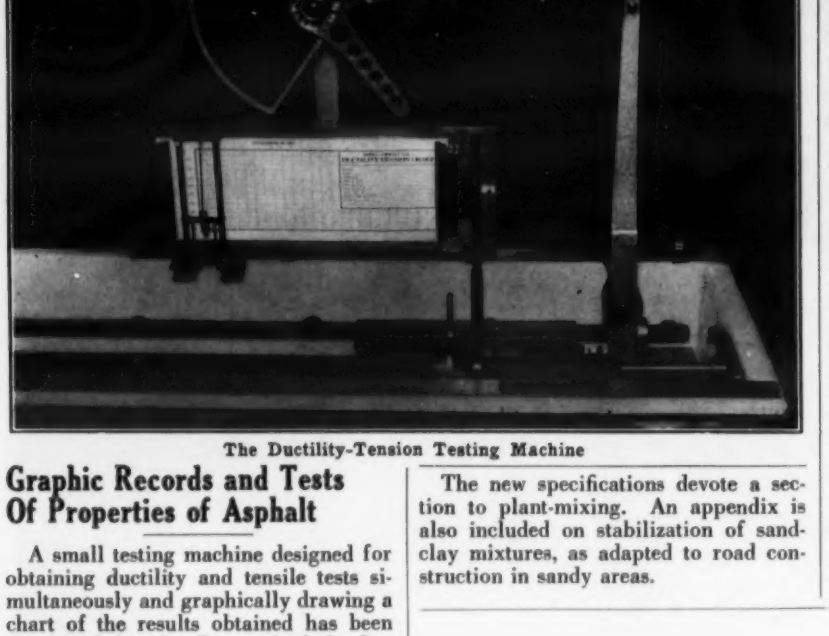

The Ductility-Tension Testing Machine

Graphic Records and Tests Of Properties of Asphalt

A small testing machine designed for obtaining ductility and tensile tests simultaneously and graphically drawing a chart of the results obtained has been developed by the Berry Asphalt Co., 1472 W. 76th St., Chicago, Ill., and was described at the 1936 Session of the Association of Asphalt Paving Technologists in Cleveland, Ohio, by H. B. Pullar and F. R. Grant.

The machine is designed to study the relative importance of ductility and tension in asphalt specimens under varying conditions. The asphalt specimen is hooked in place and pulled in exactly the same manner as upon the usual ductility machine.

The unusual feature, however, is the incorporation of a tensile weighing device which registers the pull by means of a self-inking pen which moves vertically as the tensile pulling machine proceeds, registering the tensile strength on the vertical lines of the graph. The ductility is shown by the same pen as the chart moves horizontally, thus a graphical representation of the energy consumed in the elongation of the specimen is obtained, simultaneously with the ductility reading.

Specifications for Wearing Courses for Stabilized Roads

Revisions based on the latest findings in service behavior of stabilized roads have been incorporated in a new and revised edition of "Typical Specifications for Low-Cost Wearing Courses for Roads Stabilized with Calcium Chloride and Binder-Soil" published by the Calcium Chloride Association.

The most significant change is the reduction of the proportion of soil fines. The specifications for gradation, as now revised, make accurate allowance for just sufficient amount of the binder soil to fill the voids in the frictional material. It is believed that construction conforming to the revised gradations will practically insure maximum wet and dry weather stability.

The new specifications devote a section to plant-mixing. An appendix is also included on stabilization of sand-clay mixtures, as adapted to road construction in sandy areas.

Copies of this Bulletin No. 20 may be secured upon request from the Calcium Chloride Association, 4145 Penobscot Building, Detroit, Mich., by mentioning this magazine.

Winter-Damaged Roads Need All Available Funds

With approximately $100,000,000 required to repair roads and highways damaged by extreme weather conditions this past winter, many states are going to feel the effects of having drawn upon their highway funds for non-highway expenditures. Much of the damage is confined to inadequately surfaced roads, the concrete roads having escaped with comparatively small effects of the long-stretch of sub-zero weather, early examinations reveal. However, only 30 per cent of the main state highways which carry upwards of two-thirds of all traffic outside cities, are of high-type surfacing.

The amount of funds diverted from highway funds to other uses during 1935, estimated at $200,000,000, is twice the amount needed to repair last winter's damage to roads, it is being pointed out by the opponents of gas tax diversion.

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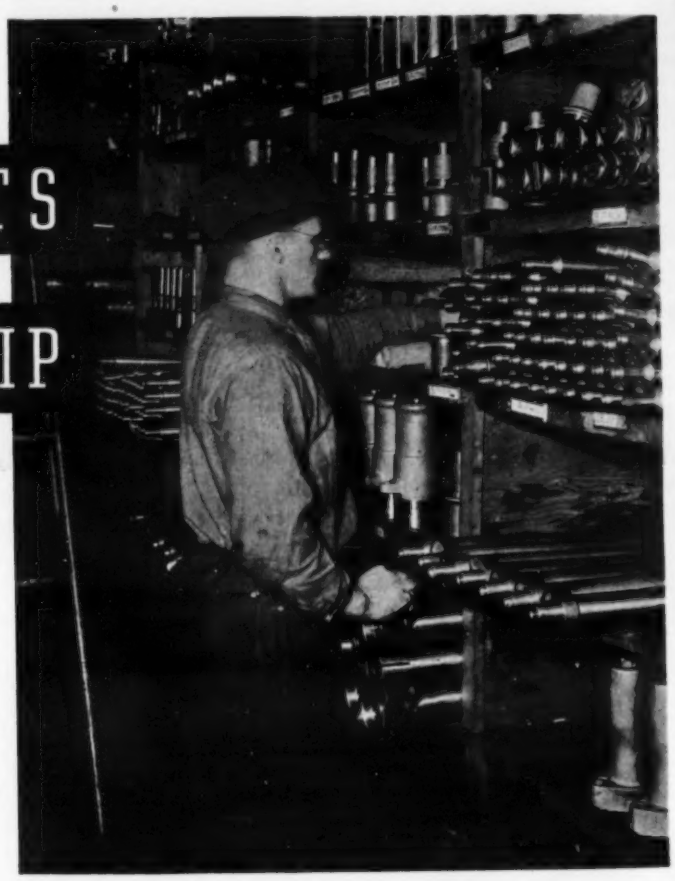

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Roadside Spraying to Prevent Fires

California's Maintenance Plan Includes Annual Expenditure of $80,000 for Spraying, Burning Along 1,100 Miles of State Roads

(Photo on page 44)

CALIFORNIA, like many other western states having an arid summer season, has a special problem in the reduction of fire hazards to property and watershed cover along the roadsides. The spraying and burning of roadside vegetation which is now underway for the 1936 season involves protective measures along 1,100 miles of state highways at a cost of about $80,000, according to a recent article in *California Highways and Public Works* by W. A. Smith, Assistant Maintenance Engineer, and is a regular part of the Division of Highways maintenance program.

The purpose of this roadside spraying and burning is to provide a firebreak between highway and adjoining property. Its justification lies in the protection afforded the property owner or public interests against the increased hazard of fire due to the volume of motor traffic which improved highways bring, as well as in the prevention of erosion damage to highways at locations where natural cover may be destroyed by fire.

Program Based on Maximum Results

The program has been planned on the basis of maximum results in fire hazard reduction for the amount spent, rather than attempting 100 per cent clearing.

In general, no spraying is done opposite locations where a natural or artificial firebreak already exists, either adjacent to or within a reasonable distance of the right-of-way. It is considered that plowed land, railroad right-of-ways, or streams paralleling the highway furnish adequate protection. Likewise, bare cut slopes 5 feet or more in height present a natural obstruction against fires being started by passing traffic.

Spraying and burning can only be carried on to advantage over grassy areas. Where brush abounds, clearing is the only effective measure and when that is done at considerable expense the area is exposed to the growth of grass and a more hazardous condition exists.

The Tank and Trailer Spraying Equipment for Weed Burning on California Highways

Methods Developed by Experiment

The spray material adopted and the methods used, as well as the equipment, were developed as the result of considerable experiment.

Under the conditions encountered in California where the vegetation dries up rapidly with the first hot days of the season, it is necessary to spray a strip either to kill or to dry out the grass sufficiently so that it may be burned while the adjacent areas are still too green to present a hazard. This strip is ordinarily 9 feet wide, immediately adjacent to fence lines and was adopted as being the maximum which can be handled by means of the spray bar equipment. It must be borne in mind

(Continued on page 33)

Argentine Engineer Visits U.S.

Justiniana Allende Posse, Chief, National Highway Administration of Argentina, accompanied by two other engineers, has been visiting the United States with the special object of studying the low-cost types of road construction in this country. The visitors landed in Miami, Fla., and spent about a month here inspecting various highways. Representatives of the Bureau of Public Roads and state highway officials assisted them in their studies of U. S. road building methods and equipment.

For the fiscal year ending June 30, 1935, the Maintenance Department of the Indiana State Highway Commission applied oil as a dust palliative on 1,028 miles of stone and gravel surfaces, while formal contracts were let for surface treating with heavier grade of bituminous material on 728 miles of road, much of which might be classed as "Stage Construction."

—*Earl B. Lockridge, Field Engineer of Maintenance*

This "Caterpillar" Diesel Tractor hauls big loads from a shovel for a few cents an hour on a coal-stripping operation in Penna.

THEY'LL TELL YOU WHY IT'S FIRST

Quick, easy starting—even in sub-zero weather when other equipment can't be moved . . . sure control and non-skid traction for sharp turns, steep pitches and soft, wet ground . . . no wonder the "Caterpillar" Diesel Tractor is first choice with drivers. Owners choose it for the remarkable cost records that back up its performance . . . earth moved at a few cents per yard . . . bulldozing, scraping, hauling at 60 to 80% reduction in fuel costs . . . maintenance costs at a record low level in spite of hard usage and 24-hour service. It's the power SHOW-DOWN—get the details from a dealer. Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

HARD FACTS ON THE SHOW-DOWN:

Report from a Massachusetts highway job: "Our 'Caterpillar' Diesel Tractor hauls two 12-yard wagons on a 1200-ft. haul from borrow pit to fill. The average round trip is completed in 12½ minutes, in spite of a 20% grade for part of the trip."

Says a Pennsylvania owner: "Our first six 'Caterpillar' Diesel Tractors have worked more than 8500 hours each and are still setting records for low-cost operation."

CATERPILLAR Diesel

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MORE YARDAGE per day

because of power and less cable overhaul.

Give the Williams "Champion" the job of boosting your profit—hook 'er to your crane now.

The Williams "Champion"

Williams digging demons also include Power-Wheel, Multiple-Rope and Dragline Buckets. Write for bulletins.

THE WELLMAN ENGINEERING CO.
7012 Central Ave., Cleveland, Ohio

WILLIAMS BUCKETS

Asphalt Penetration for Non-Skid Roads

Davidson County, Tenn., Uses Stage Construction with Asphalt Emulsion

By J. C. AKERS,
Highway Engineer, Davidson County, Nashville, Tenn.

FOR years the word penetration has been practically synonymous with slippery pavements. In fact, in our area it was the acme of slipperiness. Since it is the duty of the road designer to furnish the public with a non-skid pavement, or no pavement at all, and appreciating the ruggedness of the penetration type and the minimum cost for which in this area it can be laid, our department began to develop a method by which we could build penetration pavements that would be smooth and non-skid.

Stage Construction

Beginning at the beginning, there is no substitute for nature. The results produced by nature are the most permanent, but require time. Patience in the face of urgent insistence by the public for an immediate pavement is difficult so we have worked out a way to construct our roads in stages that will take care of the public's needs without delay or penalizing the ultimate results.

Grading and drainage to the department's standards produces a 30-foot flat section with a sight distance of 400 feet on light-traveled roads of 200 vehicles or less and 500 feet on roads of more than 200 vehicles. In the County system there are, of course, roads which will never take more than 200 vehicles a day and there are some which take 100 vehicles a day to-day and five years hence may take 600. The latter are given the maximum sight distance also. The right-of-way on the lower type roads is 50-foot minimum width and on the higher type roads 60 feet.

This grade is notched in a manner similar to that used in preparing the subgrade for concrete pavements with an inch more crown in the grade cross section than there will be in the pavement, thus producing edges 1 inch thicker than the center. The material from the notch is placed on the shoulders and together with the depth of the notch at the edge of the pavement is used in place of a form. The subgrade is made as smooth as possible, the final trimming being done by a tractor and grader to as narrow limits as this type of machinery can work, because this is the foundation of smoothness. The grade is staked out by stakes driven to finished grade on each side of the center line far enough into the shoulder from the edge of the pavement that they will not be disturbed by the pavement or interfere with construction. On curves the stakes are driven on super-elevation so that the cross section may be accurately determined by stretching a tightly drawn line from top of stake to top of stake. Thus the accuracy of the work may be checked at any time during its progress. These stakes are driven every 50 feet along the road.

Spreading and Rolling Stone Base

If care is not used in preparing the grade to receive the crushed stone the base will vary in thickness and when the stone is compacted by rolling the thicker portion of the base will compact more. It is easy to see that unless the man placing the stone can raise the surface at the point of greater thickness to compensate for the extra compaction the surface will be wavy. For this reason it is worthwhile to spend a little extra time smoothing the grade before applying the stone. If considerable settlement is to be expected the pavement is notched as above, not on the finished grade but on a grade slightly higher, and a sufficient amount of crushed stone is spread to carry the traffic. A trench for drainage is cut through the shoulder and the roadway is kept under traffic until settlement is approximately produced. Then the grade is realigned and the base is laid.

The base is composed of crushed stone 1¾ to ¾-inch with 4½ inches thickness at the center and 5½ inches at the sides. This base is thoroughly compacted and choked with fine material, the bottom course being rolled into the grade an inch or more.

Applying the Emulsion

The surface is then shot with a gallon of 60 per cent emulsion made of 85 to 100-penetration asphalt and covered with ¾ to ¼-inch chips in sufficient amount to permit immediate rolling, and rolling is continued until the surface is tight. At this stage we have produced a pavement which the public can use during the time of settlement and its use assists

(Continued on page 30)

Buckeye
Surface Material
SPREADER

A new accuracy in the placing of surface materials — absolutely assures even distribution of material from the size of sand to 1 inch stone. Eliminates hand work entirely - no smoothing up necessary. Saves time and material. "Accuracy" - regardless of variations in speed of operation.

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ignores rainy weather, soft ground and treacherous footing. It has a double set of supporting surfaces . . . more than double the bearing utilized by other types of draglines. When digging it is supported only on its large-area base. When walking, it is supported partly on the walking treads and partly on the base. Treads and base get fresh bearing surfaces for every move! Manufactured by Bucyrus-Monighan Company, Chicago, Illinois.

Bucyrus-Monighan Special 6160 Electric Dragline, working in the rain on the Bonneville Dam for Columbia Construction Company

BUCYRUS MONIGHAN

Sold by BUCYRUS-ERIE CO.
SOUTH MILWAUKEE, WISCONSIN, U.S.A.

Concreting Trestles for Grand Coulee

(Continued from page 2)

steel was erected by M-W-A-K forces. In a very short time the men became proficient in working at great heights and under stiff wind conditions.

The structures were erected as a series of towers with bents interspersed. The tower columns consist of 14-inch sections and in the case of bents, not in towers, of 36-inch I-beams, the largest size rolled. The floor system consists of 36-inch beams, six in number, spanning between bents. The longest span in which such beams alone are used is 40 feet. In the case of 60-foot spans, two plate girders were used under the gantry rails, together with four 36-inch silicon steel beams. In designing the structure, the location of the block lines naturally determined span lengths, since no member may cross a block line after the concrete is poured. Here and there a member has to be removed as the concrete comes up to it, but otherwise the structure remains intact in the dam.

The bents have a batter of ¾-inch to the foot, which is much less than in ordinary bridge construction. Again, the block lines determine this. Otherwise, the structure was designed for regular wind loads according to the standards of railroad construction. The unit stresses were, however, increased by 15 to 20 per cent over such standards, because of the short life of the structure.

Aggregate and Concrete Plant

Those who have followed the progress at Grand Coulee will remember that the concrete aggregates are secured at a point over a mile from the east abutment and are brought by belt conveyors to open storage on the east side of the river. (C. & E. M., Sept. 1935, pg. 17.) From there they are carried on a belt conveyor over a suspension bridge to the west side batching and mixing plant. A similar mixing plant has also been erected on the east side, served by another belt conveyor. Cement for both mixing plants is conveyed under pneumatic pressure a mile or more from the cement storage plant located on top of the hillside on the west bank, where it is convenient to railroad transportation.

The above in barest outline is the plan. Some conception of these relationships can be obtained from the illustration, although the east side excavation and the concrete plant erected above it do not come into the ptcture.

Concrete Placing

One of the major problems was how to place 4,500,000 cubic yards of concrete, the amount of the present contract, and do it at the rate of 12,000 or more cubic yards a day. The trestles are part of the answer. They are a means for placing concrete, not by single bucketfuls coming long distances, as over a cableway, but by train loads of buckets. Shuttle trains of Koppel cars operate over the trestle, carrying four Blaw-Knox 4-yard bottom-dump buckets to each car. They are drawn by Davenport diesel-electric locomotives and are constantly going back and forth over the two trestles, day and night, on 8-hour shifts.

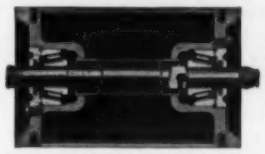
Operating on the trestles at the present time are two Colby gantry-type hammer-head cranes of 11-ton capacity on the high trestle and one on the lower. There is also one Clyde whirley full-revolving gantry-type crane on each trestle, each having a capacity of 11 tons at full boom. The ultimate development will call for four cranes of each type. The span of the gantries is 28 feet 6 inches between rails, with 115-foot reach on each side of the trestle.

The buckets of concrete are lifted from the cars by cranes and lowered to the block forms below. The dam is being constructed in blocks, of maximum dimensions of 50 x 50 feet. Some are of smaller section than this. At the present time, over 150 blocks have been started, the area under the present trestles calling for twenty blocks east and west along the axis of the dam and eight blocks across. A complete water cooling system is being laid in each, as well as a grouting system by means of which the joints between blocks will be completely grouted up at a later date when all contraction has ceased.

The illustration, though taken since the first of the year, does not show all of the blocks started up to the present time. Nevertheless, it gives a comprehensive idea of how these blocks are arranged and poured by means of cranes and buckets from above. Each block is poured in 5-foot layers.

Personnel

Grand Coulee is a project of the U.S. Bureau of Reclamation. The work is under the supervision of F. A. Banks, Construction Engineer, with J. H. Miner, Office Engineer and A. E. Darland, Field Engineer. For the M-W-A-K Co., H. L. Myer is General Manager, H. M. Slocum, General Superintendent, C. D. Riddle, Chief Engineer and Donald Nelson, Structural Engineer on the trestle work.



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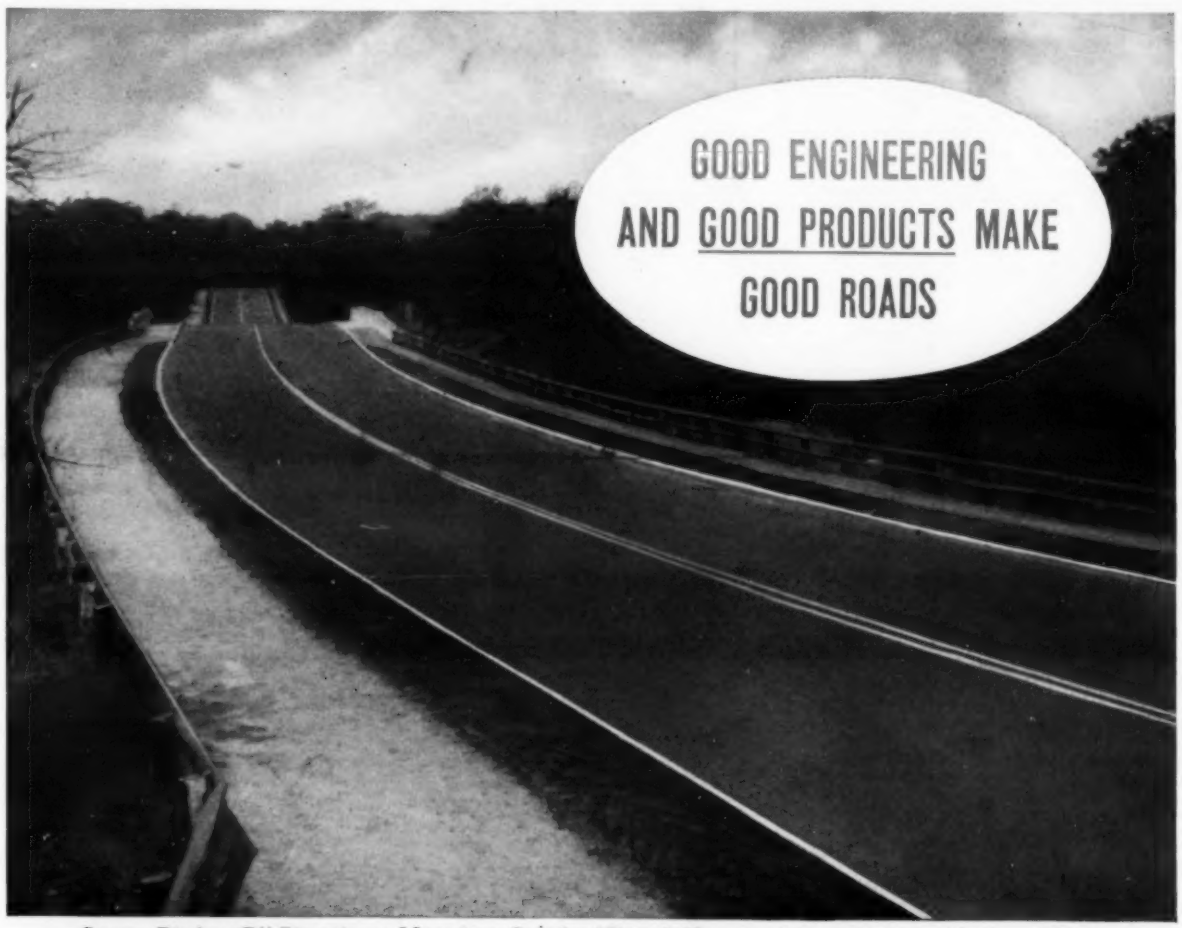

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Avoid Legal Pitfalls

These brief abstracts of court decisions may aid you. Local ordinances or state laws may alter conditions in your community. If in doubt consult your own attorney.

Edited by A. L. H. STREET, Attorney-at-Law.

Beware of Limitations on Engineers' Powers

"Extra work will be paid for at a unit price or lump sum to be agreed upon previously in writing by the Contractor and the Commission," said a contract to build a bridge across the Missouri river in South Dakota.

When the contractor demanded pay for claimed extras not covered by such agreement, there does not seem to have been any serious question raised as to the validity of this clause of the contract. The South Dakota Supreme Court said (Kansas City Bridge Co. v. State, 250 N. W. 343):

"Contractors engaged in the nature of the work here performed are neither 'unsophisticated nor careless.' It would have been a simple matter for the plaintiff to have agreed in writing with the commission for this extra work prior to the performance thereof. This provision of the contract is not an unreasonable provision, and we know of no reason why it should not be given effect."

But the contractor took the position that the supervising engineer had waived the requirement for agreement on extras. Holding that the engineer was powerless to waive compliance with terms of the contract between the contractor and the commission, the court said:

"To hold that the engineer could by his acts waive this express provision of the contract would be to extend the authority of the engineer far beyond anything given him in the contract, and override that express provision of the contract reserving to the commission the power to stipulate for extra work."

Arbitration Clause Partly Valid

"If disputes arise under this grading contract they shall be submitted to the chief engineer for final decision and neither one of us will go to law under this agreement," is, in substance what a general contractor and a subcontractor agreed.

But when "love, honor and obey" contracts are so commonly broken, it is not strange that this idealistic attempt of the parties to a mere grading contract to keep out of court should have proved abortive.

The subcontractor quit, claiming that the general contractor had broken the contract by refusing to arbitrate a controversy arising under the contract. Litigation followed and, strangely enough, it concerned principally the validity of the agreement of the parties to *keep out of litigation.*

The general contractor sued the sub for damages for refusing to complete the work he undertook. The sub replied that the general contractor could not maintain the suit, because he had agreed, but refused, to submit their differences to the chief engineer. The general contractor countered with a contention that the arbitration agreement was void as attempting to deny the right of the parties to seek redress in the courts.

The trial court—United States District Court for the Western District of Missouri—thought that the general contractor was right in his contention and entitled to damages. But the sub appealed to the United States Circuit Court of Appeals, Eighth Circuit, and that tribunal ruled in his favor (McCullough v. Clinch-Mitchell Construction Co., 71 Fed. 2d, 17.) The gist of the higher court's decision is:

That part of the agreement that provided against litigation was invalid as being against public policy. But the invalidity of that part of the agreement did not invalidate the agreement to submit their controversy first to the chief engineer for decision. Therefore, the sub rightfully quit the job when the general contractor refused so to submit a controversy between them and the general contractor had no right of action against the sub for quitting. On the contrary, the sub has a right to hold the general contractor liable in damages for breach of the agreement to arbitrate.

Injury to Inspecting Owner

"You went into this house before the subflooring had been laid, without invitation from the contractor," said the Louisiana Court of Appeal to a woman who had been injured through stepping on a loose plank that tipped downward under her weight.

"As part owner of the property, you had the right to visit the house in the course of its construction, to see if the work was being done according to contract. But since you were there without invitation from the builder and since he was not at fault for your accident, you have no valid damage claim against him. When you went onto the premises with conditions perfectly obvious you took the risk of injury arising from the unfinished state of the floor. Now you cannot shift the responsibility for an injury that resulted from your own incaution to the contractor, who was in no way at fault for what happened." (Perbos v. Barrelli, 159 So. 631.)

Contract Was Effective Though Bond Was Not Given

"We should not be required to pay damages to the subcontractor for refusing to let him go ahead with construction of that bridge, because there was no binding contract entered into," argued a general contractor's attorneys to the Alabama Supreme Court. "The contract required the subcontractor to give a bond for faithful performance of his contract and no bond was given."

"You are wrong," replied the court, in the case of Hancock v. Oliver, 154 So. 571. "There is nothing in the contract to the effect that the contract should not be binding until the bond was given. It was not contemplated that the work should commence at once, and there is nothing to show that the parties intended that bond should be given before notice to proceed with the work was given.

"If the general contractor had given notice to the subcontractor to proceed with the job and demanded a bond, the sub's failure to give the bond would have justified the general contractor in cancelling the contract. But such is not the case."

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Bituminous Retreads for County Roads

(Continued from page 11)

machines which are pulled through the aggregate by a tractor. There are also successful machines on the market which combine the features of both pre-mix and mixed-in-place types. In using one of these machines the aggregate is placed in a windrow down the center of the road and the machine comes along, picks up the aggregate, mixes it in a drum where the bituminous material is added, and then deposits the mixed material in front of a machine finisher which is part of the same plant. As these plants are more expensive than the multiple-blade retread machines, the latter are more commonly used, particularly among the county units. Another new machine recently announced for mixed-in-place retread work windrows the material which has already had the bituminous material applied and delivers it to three pug mills which thoroughly mix the materials before final screeding.

It is important that the aggregate be placed on the road in a layer of uniform thickness. This can be accomplished by the use of spreader boxes. These retreads are usually placed in one layer although two courses may be used if greater thickness is desired. A 2½ to 3-inch thickness is about the maximum for one course. When more than one course is used it is usually done for the purpose of offsetting a sub-grade which is not sufficiently strong to carry the anticipated traffic. The writer's experience would indicate that it is less expensive and more satisfactory to correct the base than to attempt to solve the problem by building thicker tops. After a layer of mixed-in-place retread has been mixed, spread out, and rolled, traffic should be allowed to use it for two weeks or more before placing a surface treatment, seal coat or another layer of aggregate. This permits the volatile matter in the bituminous material to escape, leaving a harder and more stable surface.

It is recommended that in nearly all cases a double treatment be used on the surface. The first treatment should be a drag surface treatment which will produce an excellent riding surface. This should always be followed a few weeks later by a light seal of about ¼-gallon per square yard using fine stone chips or torpedo sand for cover. This will properly seal up the surface and will also provide a satisfactory non-skid surface.

Retreads Most Important to Counties

As far as counties are concerned, mixed-in-place retreads are the most important pavement types today. These surfaces may be constructed over gravel or stone bases at costs ranging from $1,500 to $5,000 per mile, depending upon particular types and thicknesses. This gives county highway officials an opportunity to salvage a large mileage of old gravel and macadam roads, provide riding surfaces comparable to the best high-type pavements, and at the same time decrease maintenance costs on those roads. It should be kept in mind, however, that retreads are suited only for secondary roads having medium to light traffic. When used in the right places and properly constructed they will deliver all of the service which could be obtained from higher types and more expensive pavements. In counties having large cities there is always present the necessity for high-type pavements adjacent to those cities, but even in those counties there is a very large mileage which is suited to the low cost retread types.

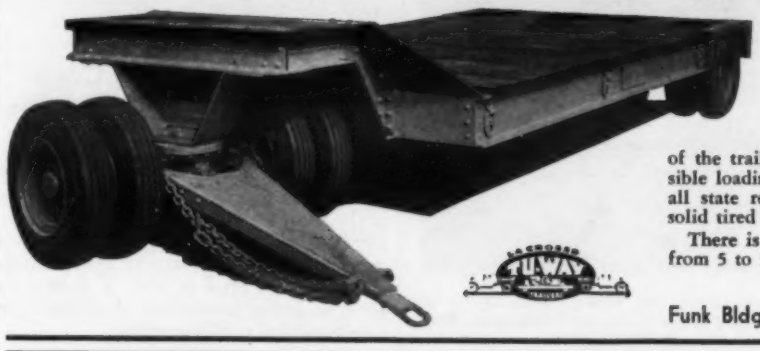
From a paper presented at the Thirty-third Annual Convention of the American Road Builders' Association.

New Motor Grader Bulletin

The four things which a motor grader should do to perform successfully on every type of grader work are listed in the new motor grader bulletin entitled "Judge Motor Graders at the Blade," recently issued by the Austin-Western Road Machinery Co., Aurora, Ill. With these four points as the basis of the bulletin, the latest 77 Senior dual-drive motor grader is analyzed to show how its design fits in with these considerations.

Attachments such as snow plows, bulldozers, scarifiers and similar equipment are described in the back of this profusely illustrated bulletin, copies of which may be secured from the Austin-Western Company by mentioning CONTRACTORS AND ENGINEERS MONTHLY.

More Payload per Pound!



CHECK it for yourself. The La Crosse Type KU brings you greater trailer strength and more payload per pound than any other trailer on the market today.

Look at the main beams. You can just see the flange in the illustration. It isn't cut but is shaped to fit the deck. Thus the beam runs the *full length* of the trailer. New small diameter tires give the lowest possible loading platform. It means a heavy duty trailer, meeting all state regulations at very little more cost than an inferior solid tired job.

There is a La Crosse trailer for every transportation problem from 5 to 50 tons.

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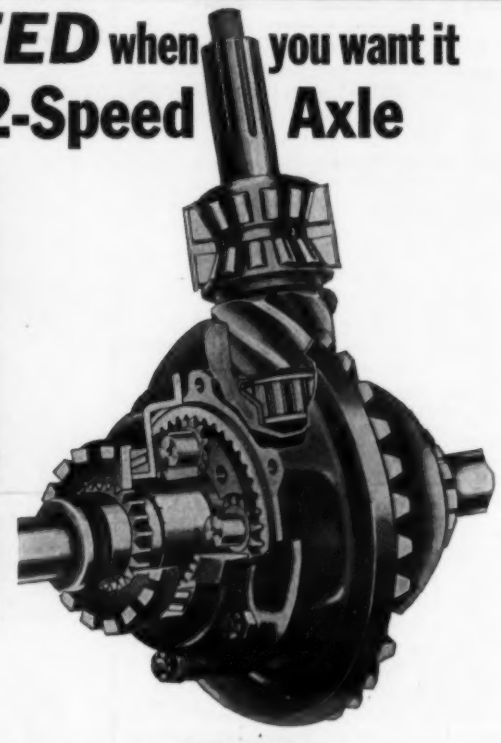
An International with 2-speed rear axle. These trucks bring new performance and economy to jobs like yours.



● The 2-speed rear axle trucks available in the International line now make it possible for truck users to obtain both high-speed and low-speed performance in one unit. A simple movement of the shifting lever changes the axle ratios instantly and silently without stopping the truck. The low-gear ratio provides *power* for hauling heavy loads through tough going and up steep hills, while the high-gear ratio allows *high speeds* on level roads or with light loads.

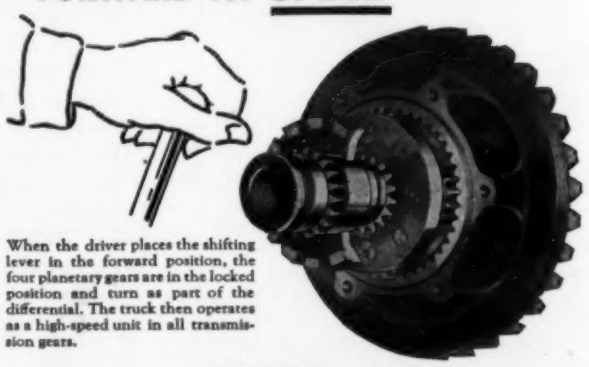
The extreme flexibility of these dual-range, full-floating rear axles enables the International 2-speed axle trucks to do more work at lower cost. When shifted to the low gear, the speed of the engine remains constant, but the speed of the axle and wheels is reduced, thereby providing unusual pulling power. In high gear, of course, the wheel speed is increased.

When you see these 2-speed rear-axle Internationals in action in a tough spot, you will get a good idea of what they can do for you. Ask the nearest Company-owned branch, or International dealer, for a demonstration. There is a full range of other trucks in the International line, from the Half-Ton unit to the powerful Six-Wheelers.

INTERNATIONAL HARVESTER COMPANY (INCORPORATED)

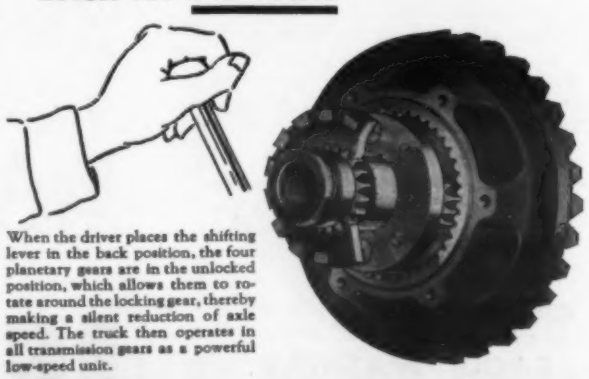
606 So. Michigan Ave. Chicago, Illinois

FORWARD for SPEED



When the driver places the shifting lever in the forward position, the four planetary gears are in the locked position and turn as part of the differential. The truck then operates as a high-speed unit in all transmission gears.

BACK for POWER



When the driver places the shifting lever in the back position, the four planetary gears are in the unlocked position, which allows them to rotate around the locking gear, thereby making a silent reduction of axle speed. The truck then operates in all transmission gears as a powerful low-speed unit.

INTERNATIONAL TRUCKS

Heroes, Born and Made, Working Feverishly to Rush a Crane to the Rescue Work at Moose River

Old Friend the Tractor Hero in Mine Rescue

Heroes are born, but they are also made! The miners who worked for 240 hours so that two men trapped in a mine in Nova Scotia might live are the born heroes. But the four Caterpillar tractors which left their routine jobs with the Department of Highways to pull down buildings for timber to line the rescue shaft and haul heavy equipment through creek beds and over rough trails to speed the rescue work,—they are the made heroes.

The story of the rescue and the work of the courageous men who fought their way in to the entrapped men is known to everyone. Less has been told, however, of the part machines played in the rescue. When the first call for aid came, these four tractors were sent to the scene to join the rescue efforts. Pulling graders, they hurriedly repaired roads to hasten the arrival of construction equipment. Working in teams, they hauled boilers, cranes and heavy timber 18 miles to the mine. Where bridges were too weak to support the great loads, the tractors pulled equipment through creek beds and back onto the road again. Hitched to the foundations of mine buildings, they razed the buildings to replenish the exhausted supply of shore timbers for the rescue work.

The Moose River rescue is the story of heroism of man, but it is something more. It is the story of the cooperative effort of man and machine and how the equipment of everyday humdrum work may be used to meet a great emergency.

After-Coolers for Air Lines

The Sullivan Machinery Co.'s line of after-coolers for compressed air lines are described in Bulletin No. 88-W recently issued by the company. Features of these after-coolers are the multipass design to provide maximum cooling efficiency from the water available, the use of a built-in separator which removes from the air the water and oil condensed in the after-cooler and the provisions made for easy cleaning of the cooling tubes.

Copies of this bulletin may be secured from the Sullivan Machinery Co., Dept. 23, Michigan City, Ind.

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and
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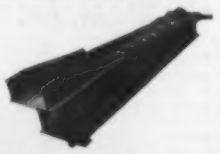
with



EAGLE WASHERS

Screw and Paddle type machines to meet particular washing and cleaning problems in sizes to suit capacity requirements. Send for bulletin W2 for complete information.

EAGLE IRON WORKS
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Branch Opened by Macwhyte to Serve Northwest

The completion of a new branch and warehouse building at 1603 N. W. Fourteenth Ave., Portland, Ore., has recently been announced by the Macwhyte Co., Kenosha, Wis. Complete stocks of Macwhyte wire rope will be maintained there for immediate delivery.

W. J. Brett, factory representative for the Macwhyte Co. in the Northwest, will make his headquarters there.

You Can Figure Tire Costs for Your Own Motor Trucks

Contractors using 1½-ton trucks can secure a tire calculator which requires the minimum effort to find out just exactly what you are getting out of your tires and if you are getting your money's worth. With a known pay load, wheelbase and the type of tire, it is easy to determine the percentage of normal tire service which you are getting.

This truck tire calculator has been designed by the B. F. Goodrich Co., Akron, Ohio, and will be sent to any readers of CONTRACTORS AND ENGINEERS MONTHLY writing direct to Goodrich and mentioning this magazine. With the tire calculator you can tell the probable life of your present tire equipment, the size tires you should use for 100 per cent normal service expectancy and actual truck tire costs.

TENTS
TARPAULINS
WINDBREAKS

The Fulton line is sold through Contractor Supply Dealers in every state. A quality line priced right. Ask for SHUREDRY and FULTEX Tarpaulins, Tents, Windbreaks.

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Fast, steady operation, the result of stout construction and Le Tourneau cable control, made this performance possible, is today increasing profits for hundreds of other Le Tourneau owners the country over.

Ask your "Caterpillar" tractor dealer to show you what Le Tourneau equipment can do for you.

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Rolling in high with a heavy load to the fill.

LE TOURNEAU

Iron Grating on Lift Span of Wellington Bridge

By BENJAMIN R. DAVIS,
Director of Park Engineering,
Metropolitan District Commission,
Boston, Mass.

Reduced Dead Load Saved In Design of Draw Span, Draw Pier and Foundation of Medford, Mass., Bridge

THE Wellington Bridge across the Mystic River between Somerville and Medford, Mass., is one of the most important highway links in Greater Boston. It is being reconstructed by the Metropolitan District Commission, a department of the Commonwealth of Massachusetts. The use of an open grating for the flooring of the draw span to lessen the dead load of the span itself, greatly reducing the counterweight required and making possible lighter piers and foundations, is one of the noteworthy features of this PWA project. The grating was not filled with concrete so the almost continuous snows of the past winter fell through the flooring rather than piling up and requiring constant cleaning.

The old bridge, which replaced the Middlesex Avenue Bridge, was built in 1904 and consisted of a wood pile trestle. A fire in 1914 made necessary the reconstruction of the Medford side of the bridge. The then new construction consisted of a wood pile foundation and platform below mean low water supporting granite piers and a reinforced concrete roadway. The Somerville and Medford sides were connected by a steel retractile draw span. The old bridge had a 54-foot roadway and two 8-foot sidewalks. Part of the roadway was used by the Boston Elevated Railway.

Handling Traffic During Work

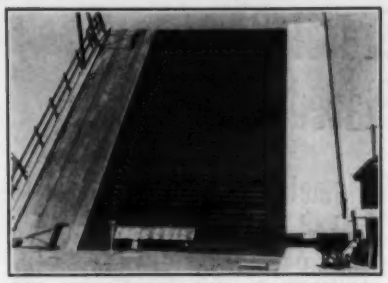
A problem in the reconstruction of the bridge was the maintaining of automobile, trolley and water traffic. Wellington Bridge is on U. S. Route No. 1 and is probably on the most heavily-traveled highway in New England. Traffic had to be maintained at all times. This was accomplished by removing the downstream sidewalk and constructing the downstream half of the bridge first. Automobile traffic was then made one way from Somerville towards Medford and diverted across the Mystic River Bridge, upstream from the Wellington Bridge, from Medford towards Somerville. Water traffic and street car service were maintained in both directions. After the downstream half was completed, the old bridge was removed and the upstream half started. A 42-inch water main is carried beneath the downstream sidewalk and is siphoned under the draw opening.

Structural Features

The new bridge is 709 feet 3 inches long and 98 feet wide overall. The layout provides for six traffic lanes and two additional lanes on the street railway track area. North and south traffic is divided by a 4-foot center island. There are eleven granite piers averaging 5 feet in width, one granite-faced concrete draw pier 33 feet wide, a granite landing pier 9 feet wide, and two granite-faced concrete abutments. All piers are built on wooden piles driven in soft blue clay. The spacing of the old piers, as built on the Medford side, was maintained at 41 feet 6 inches on center. This was done to utilize as many of the existing piles as possible. The elevation of the tops of piles for the intermediate piers is -0.5. A reinforced concrete mat 2 feet 10 inches high and 9 feet 6 inches wide was placed on these piles. The mat serves as a foundation for the granite piers. The elevation of the bottom of the draw pier is -15 and of the landing pier -10. Part of the foundation of the old landing pier was incorporated into the new landing pier. Heavy stone ballast was placed on a fine gravel base for approximately 12 feet around each pier. Excepting the draw span, the floor system consists of steel girders 5 feet on centers, encased in concrete, supporting an 8-inch reinforced concrete slab, except that portion supporting the trolley tracks where the thickness of slab is 17½ inches. A 1½-inch bituminous concrete wearing surface was placed on the concrete slab. Sidewalk curbs are of granite and exposed 12 inches above the roadway. All exposed faces of the bridge are faced with light gray granite. All structural steel used was copper-bearing steel containing a minimum of 0.20 per cent of pure copper. High early-strength portland cement was used in all concrete mats.

Lighting

Continuing the progress of sodium lighting inaugurated commercially in this country January 10, 1933 by the Metropolitan District Commission, the roadways are to be illuminated by opposite mounted sodium vapor lamps placed 80 feet apart on ornamental standards supported by the parapet post of each alternate pier.



The Downstream Lift of Wellington Bridge, Showing the Open Steel Grating, Sidewalk Grating Filled With Concrete at Right and Asphalt Plank on Street Car Area at Left

Draw Span

The draw span consists of two single-leaf trunnion bascule spans, side by side, operated by independent machinery but

(Continued on page 35)

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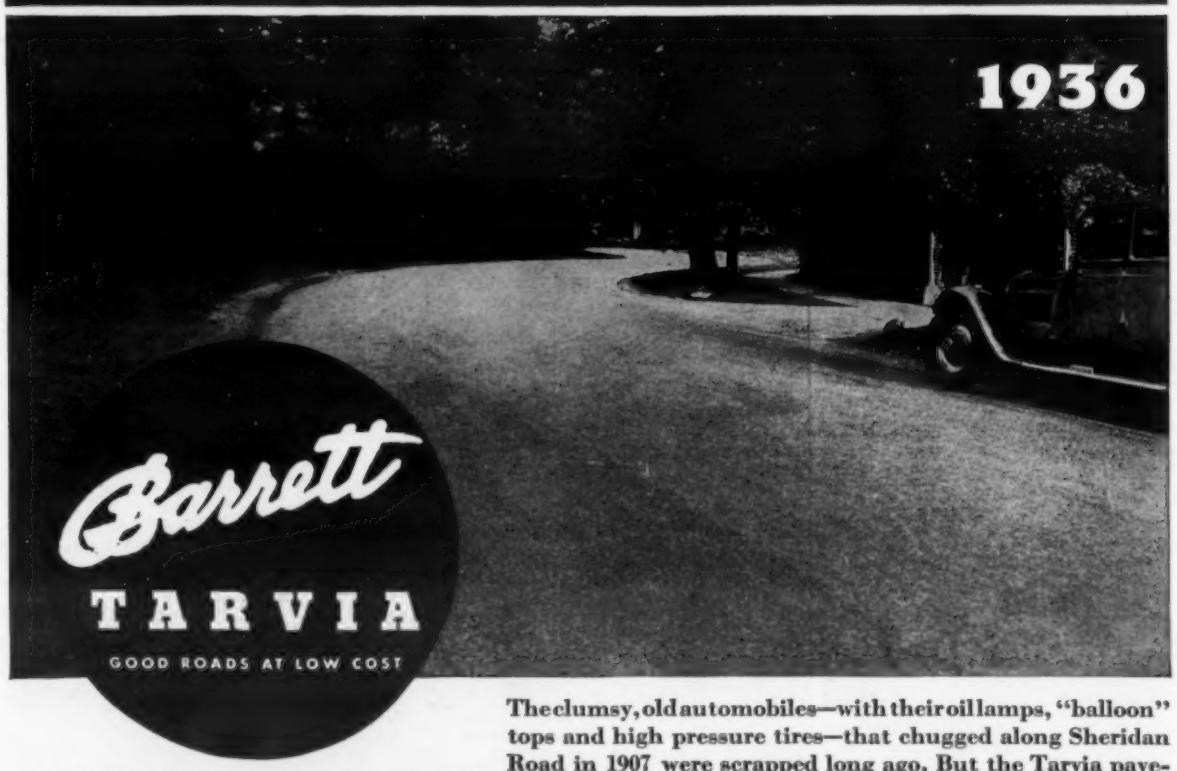

THE TECHNICAL SERVICE BUREAU of The Barrett Company invites your consultation with its technically trained staff, without cost or obligation. Address The Technical Service Bureau, The Barrett Company, 40 Rector Street, New York.

The clumsy, old automobiles—with their oil lamps, "balloon" tops and high pressure tires—that chugged along Sheridan Road in 1907 were scrapped long ago. But the Tarvia pavement is just as satisfactory—smooth, easy-riding and skid-safe—today as it was 29 years ago. Proof, indeed, that Tarvia roads "can take it," and such service records are not exceptional—for Tarvia!

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Gravel Revetment Placed by Scrapers

Willamette River Erosion Is Checked by Three Contractors Using Slackline Scrapers for Pulling Gravel From River

(Photo on page 44)

AT SEVERAL places near Independence and between Eugene and Harrisburg, Ore., the Willamette River has been undermining valuable farm lands and orchards. Last summer the U. S. Engineer Office at Portland, Ore., obtained an appropriation for gravel revetment of the river bank at points where erosion was doing the greatest damage. The specifications called for taking gravel from islands in the river and from the river bottom and placing it in a sloping fill against the eroded bank, the fill to extend several feet above the level of the adjacent fields.

This plan reached two objectives, namely, to fill the indentations in the bank where the eddies of the river had worn away the soil and to clear away the islands and bars in the river, thereby straightening the channel and reducing erosion in the future. The work was divided into a number of sections, the longest of which was about 1 mile. The first contract was let in August, 1935, and other lettings followed in September. The low bidders at the first letting were S. S. Montague and Kern & Kibbe, both of Portland. Mr. Montague planned the use of clamshell dredges and barges while Kern & Kibbe expected to use power shovels and motor trucks. Each supplemented his equipment with a Sauerman Crescent scraper.

It was soon found that the scrapers could make the gravel fills more rapidly and economically than the other equipment so with the fall rains approaching and still about 1,000,000 cubic yards to move, both contractors converted their jobs to 100 per cent scraper operations with additional equipment. Montague used three Crescent scrapers ranging in size from 1½ to 2½ cubic yards, in addition to the 4-cubic yard outfit he had purchased at the start. Kern & Kibbe who had originally used a 3-cubic yard Crescent added a second 3-yard, a 4-yard, a 2½-yard and a 2-yard and later acquired another 2-yard and a 1½-yard.

In September a third contractor entered the picture receiving the award for the final section of the work. This outfit, Kuckenberg & Wittman, used a 3-yard Crescent scraper from the start.

Method of Operation

All three contractors used essentially the same scheme of operation although different in minor details. The hoist for operating each scraper was mounted at the rear of a combination sled and A-frame built of stout timbers. The sleds were about 50 feet long. The hoists were of various makes and types. Hoists were not needed for two of Kern & Kibbe's smaller buckets as a Northwest and a Bucyrus-Erie boom machine were used to operate these two buckets.

On both the Montague and the Kern & Kibbe contracts, the sleds were set at right angles to the river and were moved sidewise on skids. The moving was done in some cases by means of a block-and-tackle operated from a drum on the hoist and at other times by hitching a tractor to the sled. Kuckenberg & Wittman set their sled parallel to the river. This facilitated moving but created extra wear on the cables which had to be run at right angles through fair-lead blocks.

At some set-ups a bridle cable was used to support the tail-block; in other cases the tail-block was attached direct to a tractor which made a very mobile arrangement for shifting.

Operating in Swift Water

Kern & Kibbe developed an interesting device for expediting the operation of the scraper bucket in swift water. This consisted of a two-wheel carrier attached rigidly to the bail and to the rear of the bucket. This was added when the bucket was working at a point in the stream where the current was especially swift. The backhaul cable, running under the sheaves, tended to lift the empty bucket on its return trip so that the bucket rode more or less on top of the water for a good part of its return travel, and after it dipped under the water, the bucket was held in an upright position in spite of the overturning force of the current.

Moving Gravel from Island onto Embankment on Kern & Kibbe's Contract

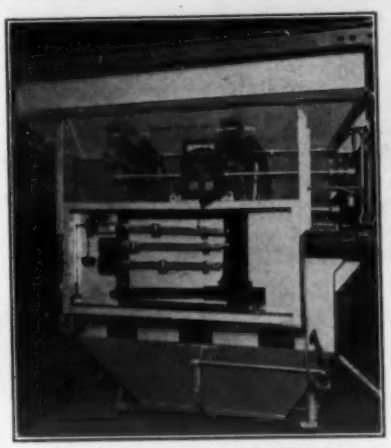
Operation Details

Other than the scraper machines, the only equipment used on each section of the work was one tractor with bulldozer which traveled longitudinally on the embankment dressing the fill. One of the 3-yard scrapers was operated by a 200-hp skidder engine. The bridle cable for the tail-block was anchored on an island of gravel about 500 feet from the A-frame. Every fourth trip of the bucket, the operator would pull it back onto the island as the contract called for taking a certain proportion of the material from the island. On the intervening trips, the bucket just scraped gravel up from the bottom of the river, so the length of haul for all trips probably averaged

250 feet. A timing of a number of trips, according to an observer, averaged better than 30 round trips per hour.

The 4-yard scraper used by Kern & Kibbe was operated by a 275-hp hoist and completed a section of embankment totaling 14,500 cubic yards in six working days. Each day consisted of four 5-hour shifts and, allowing for lost time, the machine operated about 110 hours in the six days, indicating an hourly handling of over 130 cubic yards. This is very good considering that all of the labor on the job, including the hoist operators, came from the relief rolls and was not particularly qualified for the work.

We are indebted to Oscar B. Bjorge, General Manager of the Clyde Equipment Co., Portland, Ore., for the illustrations used with this article.



The New B-K Weighing Batcher

Semi-Automatic Batcher for Three Aggregates

A new 1-cubic yard semi-automatic weighing batcher for three aggregates has recently been announced by the Blaw-Knox Co., 2067 Farmers Bank Bldg., Pittsburgh, Pa. In this new unit the filling gates are manually opened but close automatically when the correct weight is reached. An intermediate position of the gate closing permits dribble of the aggregates prior to the final cut-off.

The batcher is equipped with a three-beam scale and springless indicator with mercury contacts for automatic closing of the filling gate. Further information may be secured from the company.

Reports of Damage to Roads by Flood

(Continued from page 10)

As the flood water receded, many sections of highways in that region were covered by large cakes of ice many feet deep which had to be removed by power shovels, cranes and snow plows. This first flood period and the resulting slides and ice conditions did not seriously damage the highways.

The second flood period was much more severe and affected the Merrimack Valley region as well as the Connecticut Valley. As the flood waters rose, two bridges over the Connecticut went out, the Montague City Bridge which is a wooden-covered structure, and the Sunderland Bridge, which is a light steel through truss bridge. Several other bridges across the Connecticut were covered with water and had to be closed until an examination could be made to determine the extent of the damage. Some of these bridges will have to be repaired or replaced before they can be opened to traffic. Several bridges across the Merrimack were also closed.

Deep deposits of silt were left on many of the highways and in many cases snow plows were used to plow this material to the sides of the road. There were also innumerable washouts and landslides which necessitate repairs before the roads can be stored to normal.

Connecticut

While the section of Connecticut along the Connecticut River suffered extremely from the flood, no information is available as to the extent of the damage to roads and bridges or how the work of reconstruction and repair will be financed.

Pennsylvania

A summary of the flood damage in Pennsylvania by the Department of Highways indicates a total damage of approximately $10,000,000 of which about one-half or $5,000,000, will be required for the reconstruction of bridges destroyed by the floods and the balance for the rehabilitation and reconstruction of roads. Geographically, the flood caused considerable damage in 52 of the 67 counties of Pennsylvania, reports H. H. Temple, Chief Engineer of the Department of Highways.

At the present time the breakdown of the funds required to finance the work of reconstruction is uncertain. A large part of it must necessarily be done through the medium of the regular state maintenance funds. Applications have been filed with the WPA for Federal money for the reconstruction of bridges off the Federal-Aid system and applications are being filed with the U. S. Bureau of Public Roads for the reconstruction on a Federal-Aid basis of bridges forming part of the Federal-Aid system.

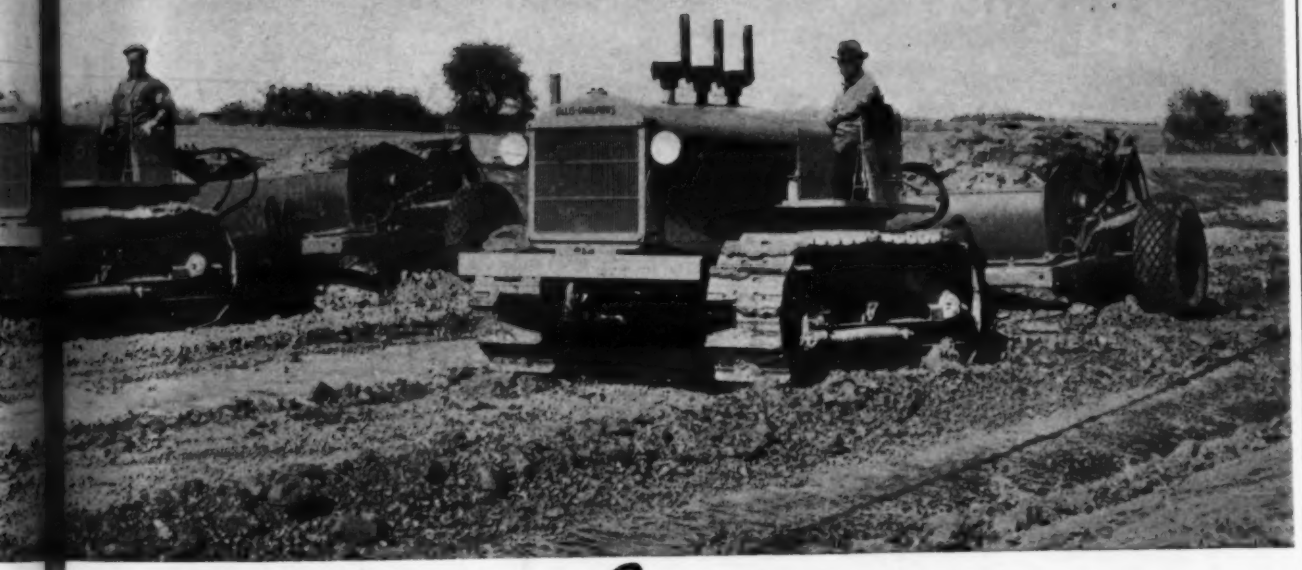
Ohio Also Suffers

Between frost and high water, the Ohio Department of Highways is also faced with a repair and restoration program this season. The Department did not ask the Legislature for an additional appropriation to take care of this work but will use its regular funds. The total estimated damage along the Ohio River amounted to $900,000, in addition to which there was about $3,600,000 damage throughout the state due to frost.

The damage included slips above and below the highways, roadbed washouts, pavement settlement, landslides, bridge approach washouts, damaged shoulders, pavement destruction and lost guard rail.

With the opening of the bridge at Taxquillo, Mexico, recently, the only remaining serious detour along the whole length of the Inter-American Highway from Laredo to Mexico City was eliminated.

GING ABILITY



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City Paving Project in Davenport, Iowa

Central Engineering Co. Laid 2 Miles of Concrete in Section Behind New River Wall

AFTER the completion of the new river wall in the East River Park section of Davenport, Iowa, and the construction of an intercepting sewer, the Central Engineering Co. of that city paved 2 miles of road as an NRM project on U.S. 67. The work provides a new outlet of scenic character to the east of the city—yes, the great Mississippi runs east and west at Davenport—overlooking the great Rock Island Arsenal grounds of the Ordinance Department, U.S.A.

Part of the 42-foot pavement was 8-inch uniform slab with mat reinforcement and the remainder of 10-7-10-inch Iowa standard section. The grade ahead of the forms was roughed in with a pony grader pulled by a Caterpillar Twenty tractor which was also used for the final grade between the forms. A Ted Carr Formgrader cut the form trench for the 10-inch Blaw-Knox steel road forms which were set by a crew of three men on a side. A Fordson-powered 5-ton roller compacted the grade to smoothness for the slab.

The batches were weighed in a Johnson plant which was kept filled with the aggregates by a P & H crane. A fleet of the contractor's own International trucks with Aristocrat steel bodies and equipped with Wood hydraulic hoists for dumping handled the dry batches. Each truck carried two batches.

A 1933 Rex 27-E paver mixed and poured the concrete which was finished with an Ord mechanical screed followed up by a Flexible Road Joint machine for setting the center strip.

Roomy 4-wheel tool houses were spotted on the grade and equipped with padlocks. Each house had pegs for hanging up coats and shovels and a compartment for hose and grease as well as other odds and ends of tools that are so easily lost on a road job, particularly in a city, unless there is a convenient place to store and lock them up.

C. & E. M. Photo

Delivering a Batch to the Paver

Personnel

The work on this contract was in charge of F. H. Schmidt, Superintendent for Central Engineering Co. and W. P. Lindauer was Resident Engineer for the Iowa State Highway Commission.

Natrona County, Wyo., Must Maintain 2,300 Miles of Road

With more road mileage than many states have in their systems, J. B. Boyer, road supervisor of Natrona County, Wyo., is responsible for 2,300 miles of highways, according to a recent story in *The Look-Around*. This constitutes quite a sizeable job, especially when storms threaten to tie up traffic. Among his many duties, Mr. Boyer has had active charge of the Casper-Seminoe Dam road which Natrona County has been building through its own and a portion of an adjoining county. The road is nearly completed and will be opened to traffic soon.

About $558,000 of road building equipment and accessories for highway construction, including excavators, scrapers, rollers and similar equipment, was imported by Brazil from the United States during 1935.

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Moving Missouri River Westward at Omaha

(Continued from page 7)

for a distance equal to 16 feet vertical elevation above mean low water, with a dragline if below the existing water level at the time the work is done and with a hydraulic grading outfit if above water. The bank is then riprapped with one-man stone placed by hand slanting uphill and lapping the preceding stones to form a compact paving with a minimum depth of 8 inches normal to the face of the slope at the top and increasing uniformly to a minimum of 12 inches at the bottom. After all stones are placed the chinks are filled with quarry spalls. This paving extends 18 inches into the water.

Then for 11½ feet riverward stone is cast to a thickness of 12 inches. On all bank, trail and spur dikes ½ cubic yard of stone of one-man size is cast about the clumps per foot of dike. This is insurance against scour around the clumps.

Revetment paving is the same as dike protection revetment except that shore piles are used at mean low water line and the mat on the bank runs up to 3 feet above mean low water and is fastened to the shore piles by wire cable.

Pile revetment, a 2-row clump dike running longitudinally, may have a compact layer of stone placed riverward in place of the casting of stone around the base of the clumps.

Dike Roots

Any dike leaving a bank has a "root fence" consisting of single piles staggered 6 feet on centers with a stringer between and a bulwark wall of stone 2 feet wide and 1 foot high under and around the stringer. The stringers are lashed to the first clumps of the dike. All bank dikes start at a point not more than 60 feet riverward from the top of the paved slope of the bank.

Work at Omaha and Gibson Bends

The C. F. Lytle contract, work on which started officially on September 16, 1933, is located south of the city of Omaha on the Omaha and Gibson bends in Douglas County, Nebraska, and Pottawattamie County, Iowa, the center of the work being about 656 miles above the mouth of the river. The original quantities in the contract, which were increased considerably with a commensurate extension of the 210-calendar-day time limit were:

7,550	lin. ft. pile dikes @ $17.51	
6,210	squares lumber mattress @ $3.00	$ 49,680.00
8,460	cu. yds. stone ballast @ $3.00	30,456.00
265	squares stone paving @ $18.00	4,770.00
189,000	lin. ft. piles @ 25 cents	47,275.00
	Total	$132,181.00
13,200	lin. ft. revetment @ $17.87	
11,350	squares lumber mattress @ $8.00	$ 90,800.00
10,870	cu. yds. stone ballast @ $3.60	39,132.00
4,460	squares stone paving @ $18.00	80,280.00
4,860	lin. ft. anchor piles @ 50c	4,430.00
85,150	lin. ft. piles @ 25 cents	21,287.50
	Total	$235,929.50
	Grand Total	$368,110.50

Note: This contract price was increased to approximately $500,000 through additional work in which the length of dikes was increased to 11,277 feet and the revetment to 18,000 feet.

Equipment

The equipment used by the contractor for this work has consisted of:

1 steamboat
2 gas tow boats of 100 and 110-hp

C. & E. M. Photo
The Shore End of a Dike Root Showing the Revetment Paving

2 gas launches
2 floating pile drivers with 24 x 60 Vulcan steam hammers
3 pontoons, 16 x 30 feet
5 material barges, 24 x 80 and 20 x 100 feet
1 gasoline hydraulic grader
2 draglines, 1 and 1¼-yard
1 crane
2 rock trucks
2 material barges, 30 x 100 feet

Personnel

For the contractor, C. F. Lytle of Sioux City, Iowa, the work was under the direction of R. Folson and E. L. McCain, as Superintendents. The work was done under the Corps of Engineers, U.S.A., Capt. J. M. Young, District Engineer, Omaha, Nebr., C. C. Cook, Area Engineer, and A. J. McGinley, Associate Engineer, Inspector.

A New Electric Hand Saw

Compact design, greater cutting speed and better balance are claimed as features of the new electric hand saw just announced by Skilsaw, Inc., 3310 Elston Ave., Chicago, Ill. This new Model 77 is 18 inches long, weighs only 15 pounds and is fitted with a 7-inch blade. It cuts 2⅜ inches in wood, will cross-cut 2-inch rough lumber and bevel-cut 2-inch dressed lumber at 45 degrees. Quick adjustments are provided for both depth and bevel cutting. The blade has a free speed of 3,600 rpm and is protected by an automatic spring-operated telescopic guard that rotates on bearings.

The frame is made of a special die-cast aluminum alloy, all shafts are ball-bearing-mounted and a blower arrangement built into the upper guard keeps the line of cut free from sawdust.

Damage to No. Car. Roads by Winter Weather Heavy

W. Vance Baise, Chief Highway Engineer for North Carolina, reports that an estimate of $3,000,000 damage to the highways of the state during the past severe winter weather is not too high, according to *The Road Machinery News.*

Mr. Baise has met with the division engineers to discuss the wide repair program necessary. All sections damaged by the unusual freezing weather will be reconditioned or retreated as quickly as possible.

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Alemite Volume Gun being used to drive lubricant over the entire bearing surface.
— Photos courtesy the Barber Greene Co., Aurora, Illinois

Here's an Alemite-lubricated Ditcher doing its stuff over a stretch of rough country.

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As the world's largest manufacturers of lubricating products, we devoted many years exclusively to this friction-fighting job. Among the thousand and more Alemite products developed in licking friction wherever wheels turn, there are many specially designed for problems like yours.

Ditchers, concrete mixers, shovels, graders, tractors, there's an Alemite System which can lick friction and prevent breakdowns on any kind of construction equipment. You'll not only avoid costly delays, but also your lubrication expense will be amazingly less.

Protect *your* expensive equipment! Replace old-fashioned grease cups and other doubtful lubrication devices with modern Alemite Fittings—in a short time—at small cost—without interfering with the job you are rushing to completion. With Alemite Controlled Lubrication, you *know* that the lubricant is reaching all bearing surfaces, forced there by Alemite's enormous pressure.

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New Road Planning Survey in Minnesota

Field activity in Minnesota's highway planning survey, which is a part of the national highway study being conducted by the U. S. Bureau of Public Roads in cooperation with state highway departments, is now under way. The first phase of the study to be initiated in the field is the weighing and classification of traffic loads at strategic points on the highways. Parties equipped with portable truck scales, or loadometers, will handle this part of the work, analyzing traffic on state, county and township roads.

Other phases of the study will include a comprehensive inventory showing the condition of rural roads both on and off the state system, a study of the use and traffic importance of specific roads and of general road financing problems.

The purpose of the survey is to provide data for long-term planning of road programs so that the public will receive the maximum of highway service at a minimum of cost. Data developed in this survey will supplement the findings of the economic road study made in Minnesota in 1934 under the supervision of the U. S. Bureau of Public Roads.

Allegheny Equipment Corp. Moves Pittsburgh Office

The Allegheny Equipment Corp., distributor for leading manufacturers of construction equipment in Pittsburgh, Pa., and Bradford, Pa., has announced the removal of its downtown Pittsburgh headquarters to its plant at Aspinwall, Pa. Its post office address is now P. O. Box 1888, Pittsburgh, Pa.

Changes in Sales Personnel

The Lincoln Electric Co., Cleveland, Ohio, has announced several changes and promotions in its sales personnel. J. S. McKeighan has been transferred to the sales staff and will make his headquarters at 1712 Catalpa Drive, Dayton, Ohio, operating under the Cincinnati District Office, 5th and Baymiller Sts., Cincinnati.

J. B. McCormick has been transferred from the Philadelphia Office to the Pacific Coast and is now stationed at 3160 Montecito Ave., Fresno, Calif., under the direction of the Los Angeles Office at 812 Mateo Street. Paul W. James has been transferred from the factory to 16½ Crandall St., Binghamton, N. Y., operating under the Syracuse office at 517 Erie Boulevard East.

"50% INCREASED YARDAGE WITH A PAGE AUTOMATIC"

An Automatic Owner writes:

"We have been convinced that the AUTOMATIC bucket has increased our production at least 50%.

"The Page bucket will dig in deep holes as long as you keep rope long enough to go deeper. On one of our jobs we had hard pan—other type buckets slid over the top of this material. The Page AUTOMATIC came through full every drag we made."*

*From a letter in our files.

You also can speed up your dragline work—increase yardage 20% to 50%. Learn all about the digging advantages of the Page AUTOMATIC—ask users—see your equipment dealer—or, write us direct. Bulletin "THE AUTOMATIC" gladly sent on request. Address Dept. "N."

"Dig With a Page Automatic"

BUILT IN SIZES 3/8 to 15 CUBIC YARDS

PAGE ENGINEERING COMPANY
CLEARING POST OFFICE - - - CHICAGO, ILL.

BLAST *the* BLIZZARD!

with Dynamite on Wheels!

FOUR POINT POSITIVE DRIVE • THE SECRET OF GIGANTIC POWER

Every phase of Walter Motor Truck construction spells strength, power and traction. Plunging through terrific drifts in mountain passes, scraping snow and ice clear down to the pavement in city streets, plunging through hard-packed drifts on country and town highways, that is why Walter Snow Fighters are called dynamite on wheels.

Talking about snow at this time of the year sounds ridiculous. However, preparedness by equipping your community with Walter Snow Fighters is a key-note to keeping roads clear, clean and open to traffic under any and every snow condition. Why not be equipped with Walter Snow Fighters which have proved so successful in many communities throughout the United States, and especially in places where snow is really a hazard?

WALTER AT ANY EMERGENCY—A sudden call for a physician in the dead of the night in a raging snowstorm—Walter will get him through. A roaring conflagration high up in the tenements of a crowded city—a Walter Aerial, hose wagon or pumper comes through. A suburban home in flames far from any water mains—Walter Chemical saves the day. Fuel oil to deliver when roads are impassable to any other type of motor truck—a Walter comes through. A heavy load to haul . . . a life to save . . . a home to protect. Walter always can be depended upon to do the job better. Ask the community that owns one.

All of the large bus and street railway companies in the principal cities of the United States and Canada, where they are obliged to clear the roads they travel, are equipped with Walter Snow Fighters exclusively.

On request we shall be only too glad to furnish you with any information you may desire.

WALTER MOTOR TRUCK COMPANY
1001-19 Irving Avenue, Ridgewood, Queens, Long Island, N. Y.

Tar-Bound Macadam Road Resurfaced with Hot-Mix

(Continued from page 5)

The waterbound base was given a seal coat of MC-1, a medium curing cut-back asphalt, at the rate of 0.4-gallon per square yard.

Placing the Forms

Because of the inequalities of the old road and the new widened base and wedge courses the contractor set the Heltzel forms for the Lakewood finishing machine first on limestone screenings and later used a mastic of 3 per cent asphalt with sand, but even this was not successful so the hot-mix material for the road was used with hand tamping to give an adequate foundation. After the forms, which have a 6-inch base and are 2¼ inches high, had been set to grade the excess mix inside the forms was cut out so that the new material would have a vertical face.

Dumping and Spreading the Hot-Mix

The insulated trucks delivered the hot-mix at a dumping temperature of about 350 degrees because all the trucks were insulated. The dumping board was a steel plate 10 feet wide and 5½ feet deep with a vertical welded plate at the front to prevent the hot-mix falling off. A 2-foot diameter hole cut in the back end of the board made it possible for a shovel man or raker to stand within the hole and not be injured if the finishing machine came up closer than usual.

There were four shovelers on this job. One dump man handled the trucks and dumped the loads in sufficient quantities just to fill the dumping board each time. There were two rakers setting joints at the outside edges of the pavement, a back man and two roller men for the gas and steam-operated Buffalo-Springfield 10-ton tandem rollers. Each roll was equipped with a sprinkler for water from a tank mounted on top of the roller, to prevent the rolls sticking to the hot asphalt. A water truck with a small pump loaded at the nearest creek and then delivered the water to the rollers.

No records for laying were made on this job because of the large amount of extra material needed per foot of road for the leveling course. This was all spread, raked and tamped by hand before rolling as the machine was not equipped for the lower strike-off, and

C. & E. M. Photo

The Three-Compartment Aggregate Bin With Reciprocating Apron Feeder

was used only on full-width work. An average of 500 feet of finished pavement per 8-hour day was maintained throughout the 40-hour week on this state project. About 160 tons of material were used per day.

Personnel

J. E. Conley is President, and John H. Simpson is Secretary of the Republic Asphalt Paving Co., of Dayton, Ohio, and on this contract F. S. Chamberlain was Superintendent of paving. W. C. Johnson is Plant Superintendent. For the State Department of Highways the work was in charge of Mathew Boylan, Resident Engineer, with C. H. Wuchter as Inspector at the plant.

Sodium Lamps Installed at Crossings in Calif.

Two California cities, Alhambra and Santa Monica, have installed sodium lamps at railroad crossings to illuminate the dangerous areas and warn motorists. In Alhambra, the three-way intersection of Garfield Avenue, Mission Road, and Park Avenue at a Santa Fe railroad crossing is now protected by two G-E 1,000 candlepower sodium lamps.

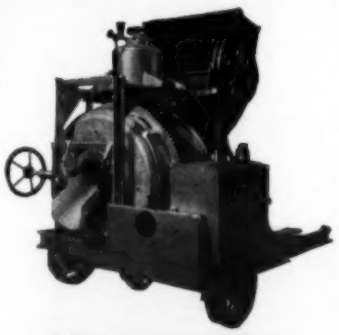
Four similar units are installed at two railway crossings 100 feet apart on Fourth street, Santa Monica.

N. Y. Distributor Opens Branch in Poughkeepsie

H. O. Penn Machinery Co., distributor of construction and industrial equipment in New York City and vicinity, has opened a branch in Poughkeepsie, N. Y., to render better service to its customers in that locality.

A complete stock of this company's regular lines, including Caterpillar tractors, Marion shovels, Smith mixers, Heltzel bins and forms, Speeder shovels, Le Roi compressors, Marlow pumps, Frink snow plows and other machinery and accessories, as well as parts and mechanics will be available at the new location. B. W. Olin, who has been with the company for several years, will be in charge and G. Berger will be in charge of service.

RANSOME



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7-S, 10-S

- Paving Mixers
- Building Mixers
- Masts and Towers
- Chuting Equipment
- Pneumatic Placers
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Ransome Concrete Machinery Company
Dunellen, New Jersey
Cable Address "Racomace-Dunellen"

Experienced Road Builders Know Their Superiority

FOR more than 63 years, Austin-Western has built the finest graders for the road-building industry.

Shown above is the current model—embodying the most advanced features. A touch of the hydraulic controls manipulates the blade and other working parts even though tons of earth and pressure resist . . . large diameter circle supports the blade ends—prevents rocking...direct draft transmits tractor power to blade for lowest possible operating costs . . . scientific design permits it to work efficiently in awkward as well as normal positions... careful manufacture gives it utmost dependability and a long life of useful service.

Austin-Western builds the most complete line of road-building equipment, including many models of blade graders. Because of the completeness of the line you may rely on Austin-Western men to give impartial advice on the most economical purchase of equipment necessary to your needs.

The Austin-Western Road Machinery Co.
Home Office: Aurora, Ill. Cable Address: AWCO, Aurora
Branches and Warehouses in Principal Cities

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ROAD GRADERS · MOTOR GRADERS · ELEVATING GRADERS · DRAGS
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The Austin-Western Road Machinery Co.
Y, Aurora, Illinois
Please send details on your No. 8 ☐, 10 ☐, 11 ☐, 12 ☐ Grader.
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Address.....627-C
City.....State.....

Bucket Repaired by Welding

(Continued from page 1)

tion 120 feet square.

The job is part of the construction of the Manhattan Intercepting Sewer which will deliver sewage to the new Wards Island activated-sludge sewage treatment plant at Wards Island from a large section of upper Manhattan and part of the Bronx.

Conditions required special sheeting, alternate steel sheet piles having I-beam stiffeners, and all were driven to rock. The contractor used a Lorain 75B run on planking carried on heavy structural steel members at street level, for excavation.

Roads to Schools Closed

Frost damage to roads in Lawrence County, Ohio, made it impossible to haul the children to school. There were 400 who were kept from school until the roads were repaired.

De Long Elected President of Waukesha Motor Co.

James E. De Long, Vice President of the Waukesha Motor Co. who succeeded H. L. Horning as General Manager, was elected President of the company at the last meeting of the Board of Directors and James B. Fisher, Chief Engineer, was elected Vice President. Mr. De Long has been associated with the firm for thirteen years, joining the company in 1923 as field engineer in the development of the company's products for the oil industry.

Mr. Fisher entered the Engineering Department of the company as chief of design in 1914. During the war he was associated with the War Industries Board in the design of the Class B Liberty truck engine.

The Waukesha Motor Co. manufactures a complete line of internal combustion engines, including gasoline, gas, Hesselman and diesel types for construction and industrial installations.

Modern Asphalt Paving

MEETS EVERY TRAFFIC NEED AND DOES IT MORE ECONOMICALLY

Let the Experience and Knowledge of Standard's Representatives Simplify Your Job . . . . . .

FOR more than 20 years the Standard Oil Company (Indiana) has been the leader in the development and production of asphalt for building roads and pavements.

Improvements in paving materials have kept pace with improvements in motor vehicles. Today this company produces a type of asphalt for every paving purpose, from *Liquid Asphalt,* of consistencies for use on ordinary earth, dirt, clay, or gumbo roads and for base stabilization, to *Cut-Back Asphalt,* which in the last decade has been used on more miles of pavement laid in the Middle West than any other kind.

There's an economical Stanolind Asphalt for every paving requirement, and Standard Oil's representatives are always ready and glad to lend the help of their knowledge and experience in the selection of materials and methods for any particular job. Telephone your local Standard Oil (Indiana) office, or write!

Copr. 1936, Standard Oil Co.

ASPHALT goes farther

STANDARD OIL COMPANY
910 S. MICHIGAN AVE. (Indiana) CHICAGO, ILL.

IN LONG-WEARING ROAD MILES . . . *IN* DISTRIBUTION OF LABOR . . . *IN* TAXPAYER SATISFACTION

New Concrete Overpass at Bedford, Indiana

Steel & Uland Build 4-Pier Deck and Girder Structure with Open Abutments

A NEST of robins in the centering is no criticism of the speed of operation of the contractor for the new 5-span reinforced concrete girder railroad overpass at Bedford, Ind. We have seen nests of birds in active batching plants, and even on the boom of a busy crane. In the construction of a new 4.1-mile project to improve State Highway 37, a new overpass was built to replace the existing structure over a C.M.&St.P. spur to Oolitic and several of the limestone working plants in Bedford, and a large open spandrel arch bridge with spans of 53, 150 and 70 feet across Salt Creek between the towns of Bedford and Oolitic.

The contract for the railroad overpass was awarded January 10, 1935 and work started on the excavation of the north abutment and north pier on February 8, using a rented Universal truck crane and clamshell bucket. The excavation at the north end was about 6 feet and not to rock. In fact, only two of the piers went to rock and the total rock excavation was about 8 yards. The south abutment and the first south pier were excavated with a Northwest 1¼-yard gas shovel.

The footings for the four piers were uniformly 5 x 42 feet, 6 inches in plan and 3 feet high, while the footings for the two open abutments were 5 x 38 feet and 3 feet high with three projections for counterforts each 5 feet wide, 3 feet deep and 7 feet long on the north abutment and 8 feet 6 inches on the south abutment.

The pier columns, three to each bent, measure 3 x 2 feet 18 inches from the top with a batter of 1 in 12 on the outside of the outer columns. The inside column is 3 x 2 feet for its full height. The height of the columns varies from 14 to 22 feet. At the top each column is widened laterally to 6 feet. The caps are 3 feet wide and 42 feet 6 inches long with variable heights because of the superelevation on a horizontal and vertical curve. The abutments or end bents consist of three similar columns with a 2-foot counterfort to ease any pressure from the approach fills.

There are six girders in each 32-foot span measuring 18 inches wide by 2 feet, 9 inches deep plus an 8-inch floor or deck. The roadway is 28 feet wide with two sidewalks each 2 feet wide and the overall width is 35 feet. The girders are standard reinforced T-beam construction with 1⅛-inch deformed rods in the bottom of the girders and ½-inch rods in the floor system.

Column Forms and Concreting

The column forms were built in sections the full height of the columns. The ends were also built in sections fitted into the sides and rodded through. Four 4-inch wales clamped the forms in place. The form lumber was 2 x 6-inch stock planed with 4 x 4-inch wales spaced uniformly 2 feet on centers.

For concreting the three northerly piers and the north abutment an Insley steel tower and bucket were used operated by a gasoline hoist. For the south abutment and the pier next to it the Smith 2-bag mixer was set on the old roadway and the concrete handled with buggies. The aggregate was struck off level in pre-measured wheel-barrows with 2 men wheeling the sand and 3 on stone. Wood tremies were used for pouring the deeper columns and Insley semi-circular chutes for the remainder of the pouring. When finishing the deck of the overpass the contractor used a longitudinal screed to insure an even smooth surface in the direction of travel.

C. & E. M. Photo

A Complete Pier and Deck Span With the Concrete Tower in the Background

Quantities

Item	Amount
Class D concrete, 1:2:3½	590 cubic yards
Class E concrete, 1:2½:4	162.5 cubic yards
Hand-rail, solid concrete	360.6 linear feet
Dry excavation	740 cubic yards
Rock excavation	8 cubic yards
Borrow for approach fill	3,190 cubic yards
Reinforcing steel	139,090 pounds
Reinforced concrete pavement	350 square yards
Special fill material*	300 cubic yards

*Note: The special fill material was sand, gravel or other permeable material placed through the abutments with a 2 to 1 slope in front and 3 to 1 slope in back.

Personnel

The contractor for this Project 37-G-603 was Steel & Uland of Bloomfield, Ind., for whom Cecil Wright was Superintendent. For the State Highway Commission of Indiana the work was in charge of O. W. Eusey, Bridge Project Engineer.

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LONG RANGE
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POWER DRAG SCRAPERS
SLACKLINE CABLEWAYS
SLACKLINE SCRAPERS
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If you have a problem of digging, conveying or stockpiling earth, clay, ore or bulk materials, write for the Sauerman catalog.

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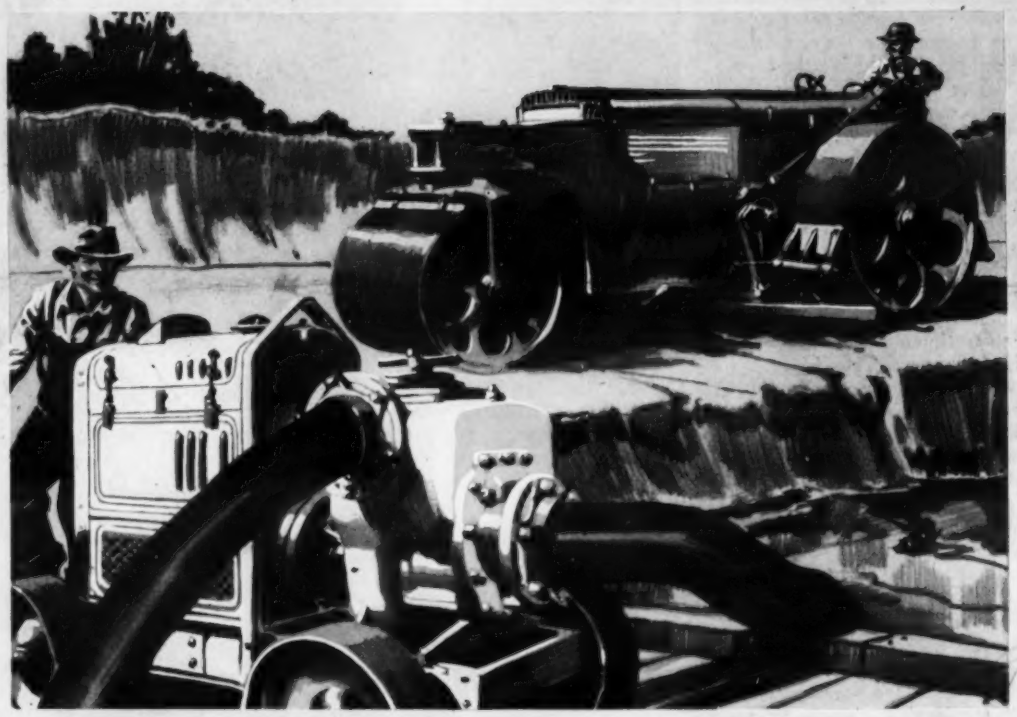
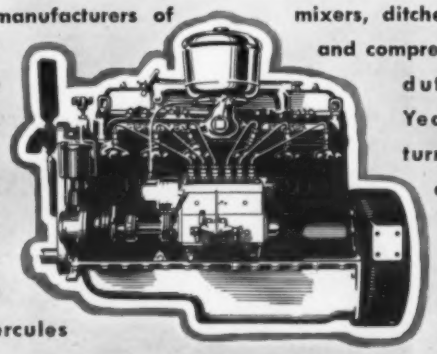
HERCULES



ENGINES

CHOICE—Hercules offers the manufacturers of all types of heavy-duty machinery a very extensive line of finely engineered, precision-built power plants. Leading manufacturers of road building, contractors' and industrial equipment have found through the years that Hercules Engines, rugged in design and conservatively rated, give their customers exceptionally long and satisfactory service. Hercules Engines, both gasoline and Diesel, are in use in all parts of the world in heavy-duty pumps, road rollers, scrapers and scarifiers; in concrete mixers, ditchers, dredges, power shovels and compressors—as well as in heavy-duty trucks and tractors. Yearly, more manufacturers turn to Hercules for dependable power. The long experience of the Hercules organization is always available to manufacturers planning new power applications.



HERCULES MOTORS CORPORATION, Canton, Ohio
America's Foremost Engine Manufacturer • Power Plants from 4 to 200 H. P.

Stage Construction in Tenn. County

(Continued from page 16)

in speeding the final settlement and in finding the spots in the base which the roller bridged over that will cause a dimple or a wave when thoroughly compacted. This base is left unsurfaced as long as the maintenance is low, even though final compaction may be obtained before it is necessary to apply the wearing surface. Because the treatment of the base produces a surface which, under reasonable traffic, is ample, some of our lighter traffic roads are built precisely as above outlined; they have not been given a wearing surface other than the base for several years and they will probably last two to four years more.

Wearing Surface

We find that in a year our bases will settle as much as ¾-inch and this settlement, although not uniform, is final. On this firm base a wearing surface 1¾-inches thick when compacted is placed. The stone used for this wearing surface should have a French coefficient of not less than seven and should be a size of 1¾ to ¾-inch. This is placed uniformly over the surface of the base. The shoulder is brought up to the elevation of the edge of the surface to serve as a form and to prevent the edge of the pavement from raveling during the time of rolling. The roller wheel on the first round laps over onto the shoulder about one foot. The stone in this surface course is adjusted during rolling to take out the settlement in the base and make a smooth riding surface. Rolling is continued until the stone is bonded and moves in front of the roller in a wave, with the individual stones locked together so that they all move together.

At this point we apply one gallon of 85 to 100-penetration asphalt per square yard, at 375 degrees F. Then ¾ to ¼-inch chips which have been stored on the shoulder are spread by hand, or by spreader boxes if the chips are hauled to the job at the time of shooting. These are spread to a sufficient depth to permit immediate rolling. Rolling is continued until final compaction is produced and the pavement is immediately opened to traffic.

Sealing

Some stone will not close up tight and it then becomes necessary to seal the surface. Our seal is so applied as not to flush the surface of the pavement and is delayed long enough so that the excess asphalt on the stone has begun to wear under traffic. Minus ¼-inch material is spread over the surface very lightly and the traffic will work it into the interstices, thus filling them from ¼ to ⅜-inch below the surface. The surface is then broomed. This brooming also removes from the interstices, which have been completely filled, about ¼-inch of the dust, leaving the surface ready to be sealed with emulsion. The dust is put in the interstices to prevent the emulsion from flowing into voids in the penetration pavement and being wasted. Upon this surface we apply 0.3-gallon of 60 per cent emulsion made from 85 to 100-penetration asphalt, resulting in a smooth and sealed non-skid penetration pavement. The emulsion leaves a thin film on the surface of the stone and does not kill the abrasive action of the stone. The choking dust being as much as ⅜-inch below the surface makes a seal below the surface so that the rough texture of the pavement is not destroyed.

Pre-Treated Surface Material

We have used a thinner surface of pretreated material from ¾ to ¼-inch thick. This material is placed on the road and smoothed with a grader before rolling. We find on the sealed type of base that this type of surface does not require sealing and still the surface is open enough to produce the rough texture pavement necessary to prevent skidding.

Subdrainage

Subdrainage is a most important factor even in rigid base construction and its importance increases with the flexibility of the pavement. In the notch prepared for the base of our roads and 2 feet toward the center from the outer edge of the pavement, a trench is begun which is dug through the shoulder into the ditch. This trench is led off down grade, of course, instead of being cut at right angles to the center line, and is cut about 8 inches deeper than the bottom of the notch. In this trench 3 to 4-inch crushed stone is placed up to the level of the bottom of the notch. When the base is completed, the cut through the shoulder is filled with finer crushed stone for another inch or two and then choked with minus ¼-inch material and covered with earth. In many of our roads that have been constructed without this subdrainage we have provided the drains through the shoulders but have found it necessary to dig back under the pavement from 12 to 18 inches because at the edge of the pavement the stone and grade and shoulder were so interlocked as to prevent drainage of the water under the pavement.

Penetration for Reconstruction

The pavement for higher type roads as described is for new construction. We use penetration as a surface on roads graded and drained and maintained by dragging under traffic when that method has produced a base ample to care for this traffic and when the traffic increase has caused this type of road to be changed to the type used for higher traveled roads. We are now experimenting with a smaller size of stone for hot penetration which we hope to prove successful this construction season.

"THERE'S A DIFFERENCE"

FLEX-PLANE Finishing Machine with wide screed equipped for screeding forward and backward will surprise you. Finishers 3 to 50 feet wide.

Headquarters for Finishing Machines, Joint Installing Machines, Combination Dowel Rod and Expansion Joint Spotters, Etc.

Flexible Road Joint Machine Company, Warren, Ohio

SERVICISED EXPANSION JOINTS

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SERVICISED QUALITY PRODUCTS

Specify nothing but the best in expansion joints.

Engineers engaged in public works construction know that prices can not be cut without sacrificing quality.

Demand SERVICISED QUALITY PRODUCTS for your highway expansion joints. They are the very best that modern manufacturing skill can produce. Nothing of their quality has been sacrificed for the sake of price.

Do not let low prices influence your judgment of quality—low prices are a sure indicator of low quality. Specify nothing but the best.

Sponge Rubber Joint

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Felt Sided Asphalt Joint

Fiber Joint

Servicised Premoulded Bituminous Specialties too numerous to mention, can solve many a construction problem better, saving time and money as well. Send our engineering department details of your special requirements or problems. If premoulded bituminous material can be used, Servicised can make it.

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New Machine Heats and Planes Asphalt Surfaces

A self-contained machine for heating bituminous surfaces and then planing off the high spots while the pavement is still hot at a rate of 15,000 to 35,000 square feet of finished work per day has been developed by Spears-Wells Machinery Co., Inc., 1832 W. 9th St., Oakland, Calif.

Traction for this Heater-Planer unit, which is mounted on a structural steel frame, is obtained through Coleman power-driven steerable front wheels mounted on a pivotal axle giving a 3-point support to the main frame. The rear wheels are rigidly mounted on the frame and run on the planed surface. Back of the front wheels is the heater hood and directly back of the hood is the cutter or planer block. The planed material is left in two windrows outside of the rear wheels where the floating rear, or clean-up, blade consolidates these rows into one moving the material to one side or spreading it straight across. The machine has 16 speed changes for each speed of the motor, which is under throttle control, so that the operator can use the correct speed.

The heating hood is 42 x 108 inches in area and is completely insulated. It contains eighteen Forster burners especially designed to withstand the extremely high temperatures in the closed space and to fire down without backfiring or blowing out. The burners are attached to one manifold and are controlled by one main valve at the operator's position.

The Spears-Wells Heater-Planer

The 42-inch cutting width Planer is a cast steel block rigidly supported on the main frame so that it can be instantly adjusted to the depth of the cut. Adjustments are also provided to angle the cutters for crown or shoulder key cutting. The block is V-shaped and has three 3/16-inch blades on each side. These blades are a special alloy, heat-treated, high speed steel to withstand the shock loads, pressure, heat and abrasion to which they are subjected. They are self-sharpening, quickly replaceable, and not high priced. The life of a set varies from 10,000 to 35,000 square feet of work, depending upon the material being processed.

Moore Elected President of Tuthill Spring Co.

H. T. Moore, for the past five years Vice President of the Tuthill Spring Co., Chicago, was elected President of the firm to succeed Frank H. Tuthill, deceased, at a special meeting of the Board of Directors. Mr. Moore has been associated with the company for nearly 20 years. W. S. Van Bergen was elected Vice President and remains in charge of production. J. H. Schmidt was elected Secretary and O. C. Nuss continues as Treasurer.

Des Moines Dealer Moves

The Major Engineering Works has moved its offices from 210 Jackson Avenue, Des Moines, Iowa, to larger and more conveniently located quarters at 312 Second Street. A complete stock of Lincoln welders, electrodes and accessories as well as Linc-Weld motors will be on display at the new location.

Wire Rope Manufacturer Has 60th Anniversary

Broderick & Bascom Rope Co., St. Louis, Mo., the oldest wire rope concern west of the Allegheny Mountains, is this year celebrating its 60th anniversary, although the company likes to put it that it is 60 years young, not old.

In celebration of this event, *The Yellow Strand*, the house organ of this firm, which by the way is the oldest publication of its kind in the wire rope industry, the first issue having appeared in October 1904, is out in a special Anniversary Number, with a number of interesting articles on the various phases of Broderick & Bascom's history and the uses of its wire rope.

BAY CITY
for stamina!

MODEL 20
FULL ¾ YD. CAPACITY
4 TON CRANE LOAD
WEIGHS ONLY 16 TONS

Just a few of the 25 Points of Superiority

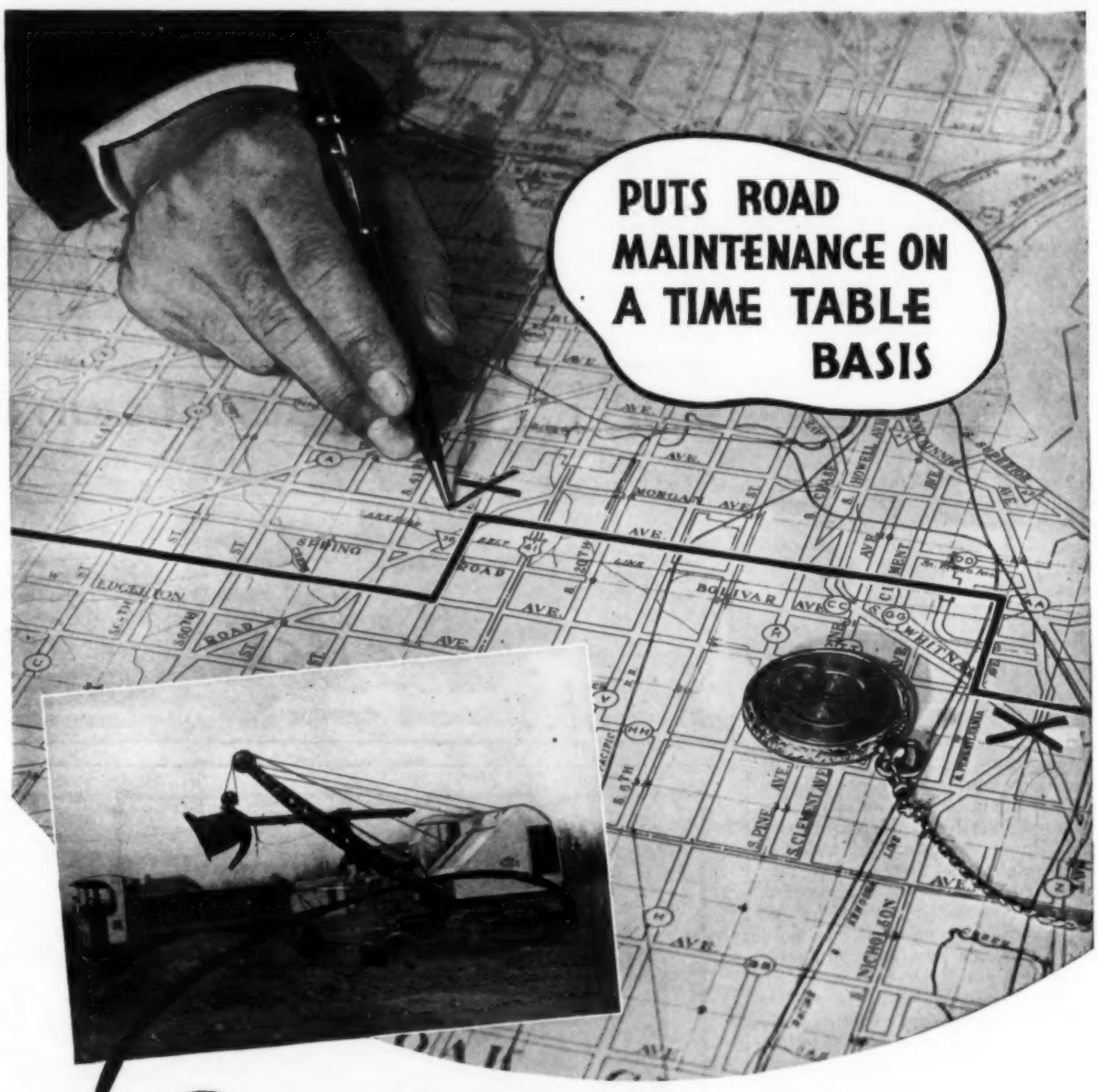
Helical cut gears—noiseless, long wearing.
Unit car body and machinery table, totally heat treated.
Frictionless bearings throout.
6 cylinder power.
Drop forged crawler shoes.
Chain crowd with automatic adjustment.
Fast operating speeds.
Safety worm boom hoist.
Separate hoist drums.
Full cab enclosing ALL machinery.

TYPES AND SIZES

Capacity	Model
⅜ yd.	20
⅜ yd. (Truck Shovel)	10
⅜ yd. (Tractor Shovel)	¾ Circle
½ yd.	30
⅝ yd.	38
¾ yd.	45
⅞ yd.	52
1 yd.	62
1¼ yd.	65

The best buy is Bay City

BAY CITY SHOVELS Inc.
BAY CITY, MICH.



Carbody and corduroy frames are welded into a single unit — lighter, stronger, so rigid it cannot "weave."

HERE'S a machine that gets around so fast you can schedule it for working time with mighty little leeway for travel time. On a truck or trailer mounting it makes forty miles an hour handily. Crawler mounted it can be loaded or unloaded from its special trailer in ten minutes. You can handle jobs all over the map with a Bantam-Weight. ● And it has many brand new features that make it a high producer for little money. High-tensile alloy steels and welded construction are used to reduce weight to a point where it can go 'most any place. ● A very rapid digging cycle with rugged non-stalling power make it a producer on all dirt-moving jobs from 50 to 50,000 yards. Write today for full information on this really new development in light-weight excavators.

HARNISCHFEGER CORPORATION
4419 W. NATIONAL AVENUE MILWAUKEE, WISCONSIN

P&H BANTAM WEIGHT
MAKES HIGHWAY FUNDS GO FURTHER
ONE OF THE 22 P&H PACEMAKERS FOR 1936

The New A-W 5-Yard Scraper

New A-W 5-Yard Scraper for 35 to 60-Hp Tractors

A new single-cable 5-yard scraper for use with tractors of 35 to 60-hp has just been announced by the Austin-Western Road Machinery Co., Aurora, Ill. The front and rear of the pan on this scraper are in the same plane while digging and the earth moves freely with the forward travel with the tractor. The wheels are so placed that they travel within the 6-foot cut of the scraper.

One of the outstanding features of this new scraper is that all operations, digging, carrying and dumping, are performed through the action of a single cable mounted on a vertical winch which requires no fairlead and is automatically locked in place when the clutch is in neutral.

The scraper cuts to a depth of 6 inches and spreads the load evenly and to any depth up to 9 inches. Because the load dumps forward and spreads the material, it is possible to operate two scrapers in tandem since the rear scraper does not climb a mound of earth left by the first. Plenty of digging and dumping clearance makes checking between the cutting bit and the front gate impossible and the scraper can be easily dumped while the tractor is traveling in high gear.

The welded H-beam frame is mounted near the pan itself and it is possible to operate close to banks or on steep slopes. The frame is rigidly braced. Truck-type tires are used on all four wheels.

Roller Bearing Crushers Have Sealed-In Bearings

The newly developed seal on the Cedar Rapids roller bearing crushers seals dirt out and keeps the grease in, thereby eliminating lubrication contamination and its resultant bearing wear. Because of this seal, the Iowa Mfg. Co., Cedar Rapids, Iowa, maker of Cedar Rapids crushers, claims that these crushers may be run for six months without changing the grease and that it is then changed only because of the possibility of moisture condensation accumulating in the bearing which might develop corrosion.

Another feature which is claimed for this seal is that because of its use only 14 pounds of grease are required to lubricate properly all four bearings, or 28 pounds a year at an average cost of about $3.50 annually. The plain bearing crushers require from 2 to 5 gallons of oil a day at a cost of about $3.00, bringing the annual cost of lubrication for a 200-working day year to about $600.

Rugged heavy-duty SKF self-aligning spherical roller bearing units, having two rows of roller assemblies per unit, are used in both the main and pitman bearings of all Cedar Rapids roller-bearing crushers. The side bearings are larger and stronger than those in the pitman, because of the additional load which they must carry and all bearings are selected of a size and load-carrying capacity greater than that normally required. The pitman bearings consist of two SKF self-aligning roller bearing units having two rows of roller assemblies per unit, one at each end of the pitman barrel. Each of these bearings is equipped with the seal to eliminate lubrication contamination.

The main frame and pitman castings are made from electric cast annealed steel. The main frame is in one piece with heavy vertical and horizontal reinforcing ribs to strengthen it against the shocks of crusher service. The pitman casting, also of one piece, is reinforced by vertical ribs on the back running the entire length of the castings. The entire crushing chamber is lined with manganese steel castings. Both the side plates and the jaws are reversible. The movable jaw is curved on the ends so that, when crushing, the lower end parallels a like section of the stationary jaw, forming a fine crushing area. The width of the jaw opening of all Iowa crushers is determined by a horizontal measurement between the movable and stationary jaws with the crusher eccentric in a neutral position.

These crushers are offered in four sizes, 10 x 20 inches; 10 x 24 inches; 15 x 24 inches and 10 x 36 inches. Any of them may be furnished on skids or mounted into portable plants as necessary.

Complete specifications of these crushers as well as a complete description of their construction features are contained in Bulletin A-2 which may be secured from the manufacturer upon request.

New Link-Belt Dealer

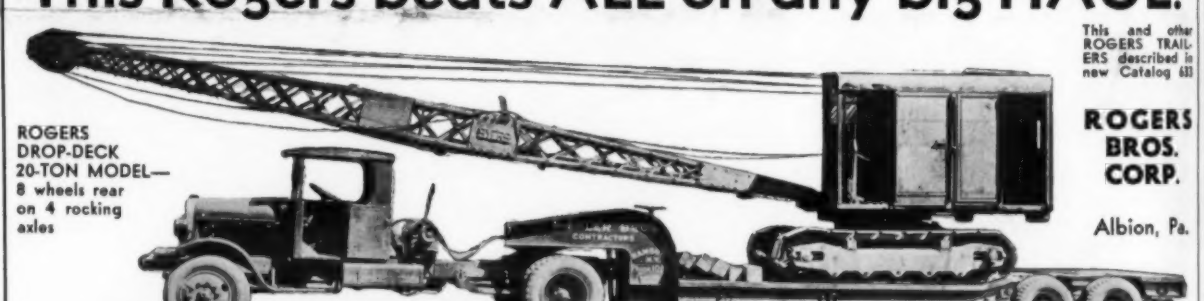
The Petrie Tractor & Equipment Co., with offices in Billings, Butte and Great Falls, Mont., has been appointed distributor for Link-Belt crawler shovels, draglines and cranes for the State of Montana.

THE LITTLEFORD TRAF-O-SPRAY

The Littleford Traf-O-Spray sprays a paint line onto any hard road surface under air pressure. A combination motor compressor, paint reservoir and hand gun in a spray head are all mounted on a light short coupled chassis. Machine is hand propelled, pneumatic tires making it easy to push on straight or curved lines even in heavy traffic. Any width line from 3" to 8" can be applied with any paint, lacquer or emulsion meeting traffic specifications. Lines are clean cut, penetrating—need no hand retouching, even by an inexperienced operator. Ask for full particulars and prices at once.

LITTLEFORD
Traffic Line Marker
TRAF-(LB)-SPRAY
LITTLEFORD BROS. 485 E. PEARL ST. CINCINNATI, O.

This Rogers beats ALL on any big HAUL!



ROGERS DROP-DECK 20-TON MODEL—8 wheels rear on 4 rocking axles

This and other ROGERS TRAILERS described in new Catalog 611

ROGERS BROS. CORP.
Albion, Pa.

INCREASING construction figures are coming in from all over the country, increased sale of Novo Equipment directly parallels the upward trend of the construction curve—wise contractors are tooling up for profit, with Novo.

NOVO SELF PRIMING CENTRIFUGAL PUMPS. Most adequately powered pumps built. The only pumps built with power unit and pump manufactured by the same company, unified control and responsibility.

They give more gallons for less money, for there is no inefficiency from overheated or overloaded engines, no expensive shut-downs for repacking, for they operate without packing. Leather seals on the impeller shaft make and hold the seal. The ideal pump for every job, and everyone knows it.

NOVO HOISTS. The most complete and up-to-date line of hoists up to 60 HP on the market. The complete line from 1000 to 15,000 pounds capacity incorporating the most practical features of hoist design. Also Novo Dragline Hoists approved the world over.

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NOVO

NOVO ENGINE COMPANY
216 Porter St., Lansing, Michigan

Roadside Spraying to Prevent Fires in Calif.

(Continued from page 15)

that efforts are directed simply to creating a firebreak and it is not intended to sterilize the soil.

For the most effective and economical results, the spray material should be applied when the vegetation is about 2 inches high. At that time the area can be uniformly covered; the growth is tender and practically a perfect kill is assured. There is the further advantage at this stage that no burning is required, although it may be necessary later to go over certain low areas where moisture starts a new growth.

Experiments have been carried on over several years to determine the most effective non-poisonous material. Various chemicals were included in these tests but nothing thus far has been discovered that is more effective than diesel oil having the following specifications to insure a uniform material of adequate toxic effect:

Specific gravity (A.P.I.) at 60 degrees F.....not less than 27 degrees Be
Flash point (Penskey-Martin closed cup).....not less than 150 degrees F.
Viscosity (Saybolt Universal) 100 degrees F.....not more than 50 seconds
Distillation—90 per cent point....not over 680 degrees F.
Water and sediment.....not more than a trace

The diesel oil is applied at the average rate of one-tenth gallon per square yard of area to be treated by means of a tank truck outfit equipped with pressure pump and spray bar. The spray bar is fitted with orchard-type spray nozzles designed to give a uniform spread. To insure this, it is also necessary that the position of the spray bar be readily adjustable. A number of designs to accomplish this have been developed.

After the oil is applied, it is allowed to penetrate and act on the vegetation which gradually turns brown. Burning operations, if required, are then started. Especial care is taken to see that adjoining property, fence posts, trees, etc., are properly safeguarded as well as provision made for the protection of traffic. Knapsack-type pumps or fire trucks are provided for each crew, and flagmen warn and direct traffic.

Costs

The cost of spraying averages from $50 to $60 per road mile of two 9-foot strips, and burning operations cost about $20 a road mile, or a total of $70 to $80.

In addition to the areas where spraying is necessary, a considerable mileage is also protected during the regular maintenance operations by blading, disking, or mowing. Protection by this means is considerably cheaper in first cost, averaging about $6 per road mile for a reasonable width.

That this program of protection against fires is justified is shown by the fact that prior to the initiation of this protective measure a number of serious fires could be anticipated each season while last year not a single fire of any magnitude was reported as having started along the state highways in California.

New Single-Phase Induction Motor for Heavy Duty

A new single-phase repulsion-start induction motor, especially designed for heavy industrial duty, has recently been announced by the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. This new Type CR motor has high starting and pull-in torques which make it particularly adaptable for pumps, compressors and similar uses. It is available in a complete line of ratings, ¾ to 3 hp, 110/220-volts dual voltage for operation on all commercial frequencies.

The CR starts as a repulsion motor and, because of the high torque developed, overcomes the relatively high inertia load to which this type of motor is usually subjected, and comes up to speed in a short time. At approximately 60 per cent of synchronous speed, the armature is short circuited by a centrifugally operated device, and the motor continues to operate as a squirrel cage induction motor.

All cast parts are of heavy section with shafts and bearings of liberal proportions. All mechanical and electrical features have been designed to produce a general purpose single-phase motor which will give long life and trouble-free operation even under the unfavorable operating conditions which frequently exist on applications where this type of motor is used.

Hough-Universal Road Sweeper Used in Fleets of From Five to Eighteen by 27 State Highway Depts. and by Over 50 Bituminous Paving Contractors.

Powered by its own Engine

Manufactured by

THE FRANK G. HOUGH CO.
919 N. Michigan Ave. Chicago

LANSING 3½-T MIXER

FOR FAST TRAILING FAST MIXING

Large mixing drum, Hyatt roller bearing wheels. Wide-tread rubber wheels and spring shock-absorbers. Alemite fittings. Lauson 2 h.p. gasoline engine. WRITE—for specifications and current prices.

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Chicago New York Philadelphia Kansas City
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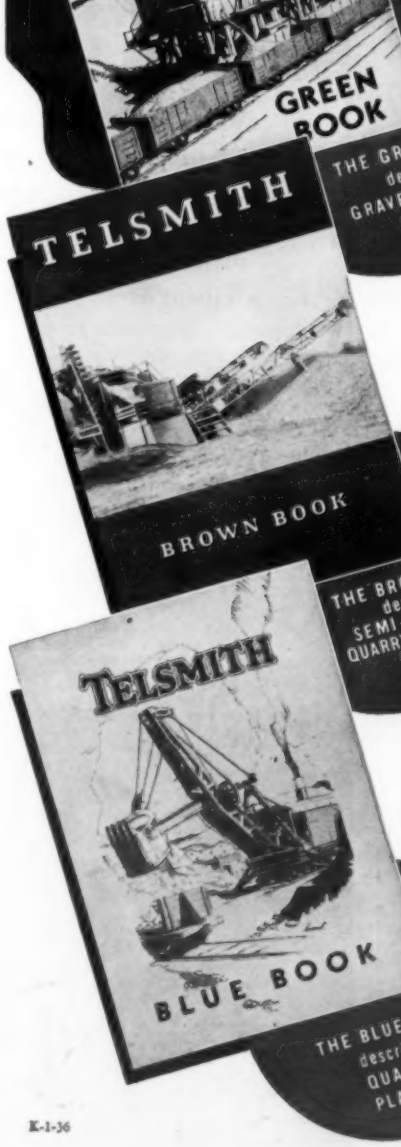
THESE 3 BOOKS TELL YOU all you want to know about *Plant Layout*



What's new in plant layout? What has been the influence of today's conditions, competition, and markets? What changes have new and improved equipment brought about in layout and production . . . in gravel washing plants . . . in quarry plants? Where do semi-portable plants fit into the present picture?

You will want to know the answers to these questions . . . and to other questions pertaining particularly to your own plant . . . whether you are modernizing or planning a new plant.

That's the purpose of these three books. They contain diagrams of actual plant layouts . . . of every size and type . . . with descriptions and specifications of their equipment and how it has been balanced and coordinated to give the wanted results.

Diagrams! Facts! Figures! Complete information in concentrated form — with the old "selling talk" hooey left out.

Any one or all these books . . . GB-34 (Gravel Washing Plants); SP-34 (Semi-Portable Plants); QP-34 (Quarry Plants)... are yours on request *without cost or obligation.*

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TELSMITH

K-1-36

Recommendation for Asphalt Is Revised

Simplified Practice Recommendation for grades of paving asphalt as determined by penetration limits which was adopted by a general conference of the industry in 1923, has been revised, according to an announcement by the Division of Simplified Practice of the National Bureau of Standards.

The revised recommendation is divided into three parts, as follows: I. For construction of sheet asphalt, asphaltic concrete, and asphalt macadam pavements, and also for surface treatment, the penetration limits are to be

25 to 30	50 to 60	100 to 120
30 to 40	60 to 70	120 to 150
40 to 50	70 to 85	150 to 200
	85 to 100	

II. For joint filler or for preparation of joint filler for various types of construction, the penetration limits recommended are

25 to 40	60 to 70
50 to 60	85 to 100

The 25 to 40 grade, without admixture, is used primarily for brick pavements. The 50 to 60, 60 to 70 and 85 to 100 grades are ordinarily used in admixture with mineral matter.

III. In adopting these limits, it is understood that the producer will furnish asphalts with penetration equal to the mid-point in each range, a plus and minus tolerance from that mid-point being acceptable to all parties, but in no case shall the deviation exceed the limit of the grades specified.

This revision, which has been accorded the required degree of acceptance by producers, distributors and users to insure its general adoption, will be substituted for the original recommendation and will be effective as of June 15, 1936.

New Cutler-Hammer Office for Maryland and Virginia

Cutler-Hammer, Inc., 12th & St. Paul Ave., Milwaukee, Wis., manufacturer of electric control apparatus, has announced the opening of a new office in Baltimore, Md., better to serve customers in the states of Maryland and Virginia. The new office at 10 W. Chase St., Baltimore, will operate under the supervision of the Philadelphia District Office. It will be in charge of R. A. Haworth.

GARDNER-DENVER MAKES A COMPLETE LINE OF PORTABLE COMPRESSORS

SIZES FIT EVERY NEED—

WBW-85 (Gasoline) WBG-315 (Gasoline)
WBD-105 (Gasoline) WBF-210 (Diesel)
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WBF-210 (Gasoline) ABH-420-D (Diesel)

Available in all standard mountings — steel wheels, solid or pneumatic rubber tires, spring mounted or on skids.

SINCE 1859 GOOD Design Materials Workmanship Value

GARDNER-DENVER COMPANY
102 Williamson Street - Quincy, Illinois

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Read the record

14 Road Rollers powered by Cummins-Diesels

The Hercules Company read the *Record* and chose the Cummins-Diesel to power these fourteen 10-ton Road Rollers which were shipped to Porto Rico to be used on an FERA project.

Every day more well-known manufacturers are choosing Cummins-Diesels to power all types of heavy duty machinery because of Cummins *proven record* for dependability, smooth running and fuel economy.

Trust the judgment of experienced engineers when you select new machinery or select an engine to replace obsolete or worn-out power equipment. See your nearest Cummins dealer or write to the Cummins Engine Company, 605 Wilson Street, Columbus, Indiana.

CUMMINS
INDUSTRIAL AUTOMOTIVE AND MARINE
DIESELS

PORTABLE ASPHALT PLANTS
TOWER TYPE
LARGE CAPACITIES
HOT OR COLD MIX
Accurate control of materials to comply with any standard specifications for bituminous mixtures.
Send for Bulletin T-248
HETHERINGTON AND BERNER INC
Indianapolis, Indiana

Open Steel Grating on the Wellington Bridge After a Snow Storm

Open Grating for Lift Span of Mass. Bridge

(Continued from page 21)

controlled from one point and so arranged that they may be operated together or singly. The downstream half was built first and put into operation while the old draw span was still open for travel. Each half of the bridge consists of a fixed span, made up of a floor supported upon a series of longitudinal girders and trusses, and a movable leaf carried by four cantilever girders, supported by trunnions resting on four fixed girders. Counterweight is placed between each pair of movable girders, balancing the span. The movable girders carry a floor which, under the track, is of wood covered with asphalt plank, under the rest of the roadway an open steel mesh grating, and for the sidewalk a grating filled with concrete. The operation is effected by machinery between two of the fixed girders, driving pinions engaging with two racks attached to the bottom flange of the movable girders. Each leaf is operated by two 30-hp alternating-current motors, with electrical brakes, gates, locks, traffic lights and navigation lights. All these devices are interlocked and piloted with indicators.

There is always a problem as to what type of floor should be used on a lift bridge. Considering that for every pound of weight on the span there is 3 to 4 pounds of counterweight required, and that this weight requires heavier construction of the draw span, draw pier and foundation, the problem becomes translated into dollars and cents. After much investigation, an open steel grating was used. It is interesting to see why.

Open Grating Floor for Lift Span

There are many drawbridges in and around Boston built in the days of horse-drawn vehicles and pleasure cars. These bridges were not designed for modern heavy loads, and in many bridges signs were placed limiting loads from 6 to 10 tons. The floors of these bridges were usually designed for wood or wood blocks, which were slippery in wet weather and needed constant maintenance and repair. As heavier loads came it was obvious that a new type of floor was needed to replace the wooden floor. Many new types were studied, but in each case the dead weight of the floor was greater than the existing weight. An article appeared in a trade magazine at this time which described an open floor on a bridge that was being constructed in Seattle, Washington. Investigation showed that the floor weighed approximately 15 pounds per square foot for an H20 loading. This weight and strength was ideal for the modernization of the old drawbridges, for as the dead weight was cut down, the bearing capacity of the bridge would be increased. The Mystic River Bridge was being designed at this time, and it was decided to try this type of floor on the draw. Since it was a question whether an open floor would appeal to the public, it was decided to fill the grating with concrete. This floor weighed about 40 pounds and represented a saving in dead weight as well as a permanent floor. The grating was filled with concrete in which no stone was larger than ½-inch and then vibrated. The results of this floor were so pleasing that it was decided to try an open grating on Wellington Bridge. The floor of the draw span was designed for an open steel grating with the provision that if necessary the floor could be filled with concrete and additional concrete added. The weight of the grating was 15 pounds per square foot. The downstream half of the bridge was opened to traffic on October 19, 1935. The open floor has proved so satisfactory that the Metropolitan District Commission is now modernizing the drawbridge on the Charles River Dam in Boston, by replacing a wooden floor with open steel grating.

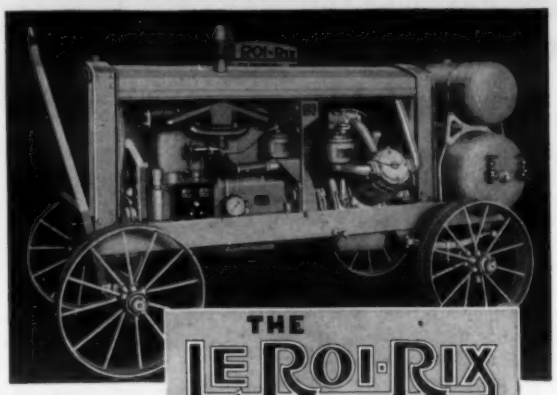
On January 18, 1936 a 15-inch snowfall covered Wellington Bridge. Snow fell through that part of the bridge that was covered with open grating but remained wherever the floor was solid. The effective width of the roadway was reduced after the snow was plowed to the side everywhere except on the draw. It is often impossible to open a solid decked bridge until the unbalanced snow load has been shoveled off.

The steel grating used was furnished by the Irving Iron Works. The main carrying bars are 2½ x 3/16-inch, spaced 2½ inches on centers, and are braced by 1½ x 3/16-inch bars fastened to the main bars by ⅜-inch cold-driven rivets at intervals of 5 inches. This grating supports an H20 loading. The sidewalk is covered with a 1½-inch steel grating connected by diagonal members and filled with concrete to provide a smooth surface for pedestrians. The sidewalk is designed to carry a live load of 100 pounds per square foot. All grating is made of copper-bearing steel.

It is expected that the upstream half of the bridge will be completed in August, 1936. The total cost of the work will be approximately $1,000,000. The bridge is being built under the National Industrial Recovery Project Mass. State D-1, P. W. A. Docket No. 4478. The contractor on the fixed span is Coleman Brothers Corp. of Boston and on the draw span, Wisconsin Bridge & Iron Co.

"A Grade Crossing Section" has been created within the Ministry of Public Works of Spain for the purpose of studying grade crossing elimination and making recommendations as to the need of such elimination as well as the guarding and inspection of grade crossings.

LOWER COST AIR



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OFFERS more for your money! Le Roi Valve-in-Head Engine, spring mounting, better cooling . . . just a few of many reasons why we can give you lower operating and maintenance costs, as well as longer life, in Le Roi-Rix Air Compressors. Available in single or two stage, portable or stationary, all mountings. Put your "air" problems up to us.

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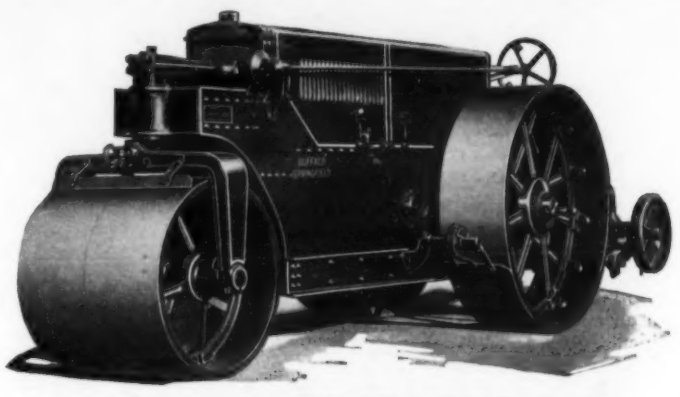

ESSENTIALS

• Long life and low operating costs should be considered above all other features in the selection of a road roller. Buffalo-Springfield's ability and reputation for furnishing these essential qualities have remained unchallenged for forty-five years.

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TRUKMIXER BATCHING PLANTS
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To Fulfill Contracts Speedily and Profitably
New developments and improvements in Blaw-Knox Construction Equipment are right in step with today's program.
With a background of years of practical experience, Blaw-Knox equipment is trustworthy. It is economical and low in maintenance. Designed to stand up under severe operating conditions, it is fitted to the job by skilled engineers. It helps immeasurably to fulfill contracts speedily and profitably.
BLAW-KNOX COMPANY, 2007 Farmers Bank Building, Pittsburgh, Pa.
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CLAMSHELL BUCKETS
GAS-ELECTRIC ROAD FINISHERS

Safety Features for Washington Highways

(Continued from page 1)

were developed and manufactured by the General Electric Co., are 10,000 lumen units each and are placed at 200-foot intervals on alternate sides of the pavement. The cost of installing this system was $4,000 per mile, including fixtures and supports, and the cost of maintenance and power is estimated at $647 per mile per year. While the cost of this installation reflects the favorable conditions under which the construction was made, the cost of sodium vapor installations generally would be reduced with more extensive use of this type of lighting, due to reduction in cost of lamp bulbs with increased production and less necessity for replacements with the development of longer-lived bulbs after more experience in their construction. Greater efficiency will result with improvements and refinements in the design and manufacture of these lights and it is therefore indicated that the above costs would be the maximum for installations of this type.

Lighting Effective in Fogs

The installation on the Pacific Highway was made on a new section of road before it was opened to the traveling public and therefore no records are available for comparison as to the number of accidents prior to the installation. However, from observations, it is quite evident that the lighting system has effected great savings to the users of this section of the highway and has prevented great losses which would undoubtedly have been occasioned by collisions and other accidents.

From the results which have been obtained and with further development in the manufacture of lights for highway purposes it may reasonably be expected that a large number of installations may be made in the near future on the heavily-traveled sections of the highway.

Road Maintainer Unit with Diesel Power

The latest addition to the Caterpillar diesel line is the No. 10 diesel Auto Patrol, the second road maintenance machine in the company's line with a compression ignition engine. The new unit is powered with the same 4-cylinder 4-cycle diesel engine used in the RD4 tractor. This power plant with a 4¼-inch bore and 5½-inch stroke develops 44 hp at a governed speed of 900 rpm.

This new model is available with either tandem or single drive. The front wheels are equipped with 7.00-20 tires, 11.25-24 low-pressure tires are furnished on the rear wheels of the tandem drive model while the dual rear wheels of the single drive machine carry 9.00-24 tires. Twelve-foot blades are standard equipment on both machines.

The No. 10 has full power control. All operating controls of the blade and scarifier are accomplished through power control levers grouped directly in front of the operator's seat.

The machine weighs approximately 15,600 pounds in the tandem-drive model and 13,000 pounds with the single drive. Both models are provided with four speeds forward and one reverse, the forward speeds ranging from 1.8 to 10 miles an hour.

With the announcement of the No. 10 diesel Auto Patrol, the larger machine formerly known as the diesel Auto Patrol becomes the No. 11 model. Spark ignition as well as diesel models will continue to be available in both sizes.

Complete information on this new machine as well as other Caterpillar equipment may be secured upon request direct from the Caterpillar Tractor Co., Peoria, Ill.

Two 44-Mile Pipe Lines Recently Completed

With mud so heavy that at times extra tractors were required to move the equipment, two 44-mile pipe lines, one a 6-inch natural gas line and the other an 8-inch crude oil line, were recently completed between Tepetate Field and Lake Charles, La., by H. C. Price, Inc., contractor of Bartlesville, Okla.

The new lines, which were laid for the Continental Oil Co., were put in the same ditch, lined up side by side, and every joint of each line was welded, this being carried on simultaneously. Standard pipe line welding procedure was followed by two welding gangs, one starting at each end of the job.

The pipe, which was lined up by a tractor equipped with a pipe handling rig, had ends beveled at a 30-degree angle. The welded joints were plain-end type without a backing up ring. Three beads were used per joint, the first made with 3/16, the second with ¼ and the third with 5/16-inch electrodes. The pipe was welded in 240-foot sections on the firing line. Four men, one tacker and three welders, welded the firing line joints at the rate of 4.2 joints an hour.

The Lincoln shielded-arc equipment which was used was equipped with a special time-delay idling device which shuts down the engines 30 seconds after the arc is broken, thus saving up to 4 gallons of gasoline a day, according to the contractor's report.

OUTSTANDING PERFORMANCE

The Littleford No. 84-HD new style kettle will quickly and economically melt any tar, asphalt or other bituminous road materials. Heat from burner passes over full length of kettle twice before exhausting through stack because of Littleford exclusive Double Heat Circulation. Screened Reservoir separates cold and hot material; speeds up melting time. These two features save 1/5 on fuel and same on time.

It is made in 50, 75, 110, 165 and 210 gallons capacity. Rigid, round nosed channel running gear, 8 leaf semi-elliptic springs, 1½" axles with Timken Roller Bearings, wide splash proof flanges enable you to trail this fire-proof kettle at high speeds.

Ask for prices and particulars

LITTLEFORD

Road Maintenance Equipment

SINCE 1900

THE SIGN OF A GOOD HEATER — LB — LITTLEFORD BROS. CINCINNATI, O.

LITTLEFORD BROS. 485 E. PEARL ST. CINCINNATI, O.

LAYING BLACK TOP?

JAEGER PAVER has 10 ADVANTAGES:

- 18 Ft. Movable Forms Give Smoothness of Concrete,
- 50% More Traction,
- No Load on New Material,
- Adjustable 9 to 14 Ft. Widths,
- Blends Perfect Joints,
- Capacity to 1000 Tons a Day,
- Lays Hot or Cold Bituminous, Stone or Macadam,
- Pug Mill Spreader,
- Less Hand Finishing,
- Automotive Construction,

Write for New Catalog, Prices.

THE JAEGER MACHINE CO.
701 Dublin Ave., Columbus, Ohio

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Change of Address Slip

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470 Fourth Ave., New York

Please change my address on your records

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HEIL

DIG-N-CARRY SCRAPER

The All-Purpose Earth Mover

It Digs—It Carries—It Spreads—It Grades

Put one of these efficient hydraulically operated scrapers to work for you and watch dirt moving costs slide down to a new low figure—Send for latest bulletin:—Address:

THE HEIL CO.
3000 West Montana St.,
MILWAUKEE WISCONSIN

Work of Counties Is Increasing in Scope

In the past five years the mileage in Wayne County, Mich., for which the Board of County Road Commissioners is responsible, has increased from 604 miles to 1,143 miles, according to the 1935 report of the Commissioners.

With the passage of the McNitt Act in 1931, the county was required to take over the entire township road system at the rate of 20 per cent per year, the final section of which was taken over late last year.

During 1936, under the requirements of the same Act, the county is required to take over all subdivision streets and alleys outside of incorporated cities and villages, which will add 772 miles of streets and 373 miles of alleys to the county system, bringing the total up to 2,287 miles of roads.

The county also has built and maintains 118 modern bridges, and along the newly-acquired township roads there are approximately 50 other bridges of lighter type which must be cared for. Among these bridges are the three bascule bridges over Rouge River at the city limits of Detroit and one swing bridge at the Trenton Channel of the Detroit River to Grosse Ile. In addition, including those under construction, there are 65 grade separations on the highways of Wayne County, 12 of which are at highway intersections and the remainder at railroad crossings.

While the system of highways under the county jurisdiction has thus been quadrupled in the past few years, the funds have been drastically reduced and at the same time, the lower types of roads introduced into the system require many improvements and are expensive to maintain.

At present the automobile weight and gasoline taxes yield about $3,200,000 which may be used for highway construction, maintenance and improvements and for such aid as the county may give in the widening of arterial city streets. In addition, the county receives a second amount of about $3,200,000 which is required by law to be applied to meet the debt service of the county, township and Covert bonds, which was formerly met by property taxes. Any excess remaining from this second amount after such debt service has been met must be divided among the cities and villages of the county. It is estimated that from the automobile weight and gasoline taxes of 1935, the cities and village of Wayne County will thus receive $770,000, of which $653,000 goes to Detroit.

Michael J. O'Brien is Chairman of the Board of County Road Commissioners of Wayne County, Mich., with Edward H. Hines, Vice Chairman and Peter M. Schoenherr, Commissioner. Mr. Hines has been a member of the Commission since 1906.

Asphalt Institute Issues Folder for Contractors

A well-illustrated folder, entitled "Smooth and Lasting Asphalt Surfaces Are Inexpensive" has been prepared by the Asphalt Institute to aid asphalt paving contractors in developing a market for asphalt mixtures. This folder, which is non-technical, is designed to inform public officials and property owners concerning the uses, cost and lasting qualities of asphalt paving.

Contractors may secure these folders in quantities with their company name and address imprinted on the front, at a nominal sum from the Asphalt Institute, 801 Second Avenue, New York City.

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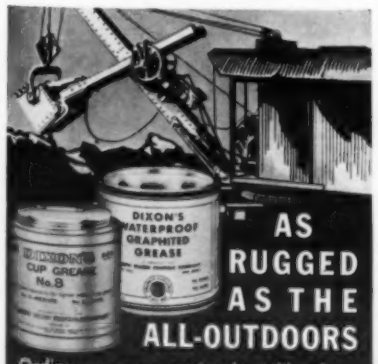

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Speeding Up Dragline Work

727 The Page rounded front Automatic dragline bucket, which is designed to speed up dragline work and increase yardage, is described in a free bulletin "The Automatic" which Page Engineering Co., Dept. N, Clearing Post Office, Chicago, Ill., will send on request.

A Steel or Aluminum Straight-Edge

728 The Giantgript straight-edge, in either steel or aluminum, which has two usable edges, one sharp-cornered and squared for scraping and the other rounded for line-point straight-edging, is described in literature which may be secured direct from the L & M Mfg. Co., 10302 Berea Road, Cleveland, Ohio.

Corrugated Pipe for Drainage

729 Complete information on Gohi corrugated pipe and how this pipe may be used in solving your drainage problems may be secured by interested contractors and engineers from Gohi Culvert Manufacturers, Inc., Newport, Ky.

Mechanical Concrete Strike-Off

730 The Ransome mechanical unit for striking off the lower course of concrete before laying the reinforcing mesh is described and illustrated in literature which may be secured upon request from the Ransome Concrete Machinery Co., Dunellen, N. J.

New Shovel and Crane for Truck Mounting

731 Catalog No. 10 recently issued by Bay City Shovels, Bay City, Mich., describes and illustrates in detail the new Model 10 truck shovel and crane which carries a ⅜-yard bucket when equipped as a shovel and has a capacity of 3½ to 5 tons as a crane. Copies of this bulletin may be secured from the manufacturer on request.

Oil-Burning Engines

732 The Waukesha-Hesselman engine, which is easy to start, burns high-speed diesel fuels, and has low upkeep cost, is described in Bulletin No. 918 which the Waukesha Motor Co., Waukesha, Wis., will be glad to send on request.

Pneumatic-Tired Barrows and Carts

733 Lansing Co., Lansing, Mich., will be glad to send to interested contractors complete information on its pneumatic-tired 4-cubic foot capacity wheelbarrows and its 6-cubic foot utility carts.

Wire Rope for Construction Service

734 Williamsport Form-Set preformed wire rope and its applications in the construction field are described and illustrated in a new catalog just off the press which the Williamsport Wire Rope Co., 122 So. Michigan Ave., Chicago, Ill., will send upon request.

New Dowel Support for Transverse Joints

735 Wheeling Corrugating Co., Wheeling, W. Va., will send on request complete details on its new device for supporting dowel bars at transverse contraction and expansion joints during concrete road construction.

Excavating Equipment

736 Parsons trench excavators, trench backfillers, terracing graders and other equipment are described in literature which Parsons Co., Newton, Iowa, will be glad to send on request.

Tar and Asphalt Kettles

737 White oil-burning tar and asphalt kettles in several models and capacities for patching and maintenance work are described in literature which interested state and county highway officials and contractors may secure upon request from the White Mfg. Co., Elkhart, Ind.

Steel Trench Braces

738 Simplex drop-forged steel trench braces, which are designed to combine greater safety and strength, as well as years of economical service are described and illustrated in literature which Templeton, Kenly & Co., Ltd., 1020 So. Central Ave., Chicago, Ill., will send on request.

Make an On-the-Job Truck Test

739 An on-the-job test of Ford V8 trucks, using your own loads under your own operating conditions, may be arranged through your local Ford dealer, according to the Ford Motor Co., Dearborn, Mich.

Metal Accessories for Road Construction

740 Complete information on Servicized metal accessories for road construction may be secured by interested contractors and engineers from the Servicized Products Corp., 6051 W. 65th St., Chicago, Ill.

Two-Wheel Concrete Mixers

741 CMC new two-wheel concrete mixers with pneumatic tires and roller bearings are described in a free bulletin which may be secured upon request from the Construction Machinery Co., Waterloo, Iowa.

Air, Gas and Electric Vibrators

742 Complete information on the new Mall air-operated concrete vibrator for use on all types of construction work, as well as on its gas-engine and electric-motor-driven concrete vibrators, may be secured by interested contractors direct from the Mall Tool Co., 7743 So. Chicago Ave., Chicago, Ill.

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Graphite Products on Construction Jobs

743 The uses of Dixon's graphite greases and lubricants for keeping construction equipment operating at full efficiency and minimum operating costs are described in Booklet No. R-W148 which the Joseph Dixon Crucible Co., Jersey City, N. J., will be glad to send on request.

Bituminous Material Distributor

744 The South Bend Model 200 bituminous material distributor which has a rated capacity of 300 to 2,000 gallons and can be mounted on any truck or trailer, is described in literature which the Municipal Supply Co., South Bend, Ind., will send on request.

Road Finisher-Spreaders

745 Catalog No. 1523 describing the Blaw-Knox Road Finish-Spreader, which will spread and finish stone or gravel, hot or cold asphalt from 1 to 15 feet at a time, may be secured by those interested from the Blaw-Knox Co., 2067 Farmers Bank Bldg., Pittsburgh, Pa.

The Right Bucket for the Job

746 The Hayward Co., 32-36 Dey St., New York City will be glad to make suggestions as to the right type of bucket, clamshell, dragline, electric-motor or orange peel, to meet most satisfactorily the special requirements of your job.

A Self-Powered Road Sweeper

747 The Frank G. Hough Co., 919 N. Michigan Ave., Chicago, Ill., will be glad to send to interested contractors and engineers complete information on the Hough-Universal road sweeper, which is powered by its own engine, for use by state and county highway departments and on bituminous road jobs.

Alloy-Steel Dragline Bucket

748 The Williams DXL dragline bucket which is made of special alloy steel to lighten its weight and increase its load is described in literature which may be secured upon request from the Wellman Engineering Co., 7012 Central Ave., Cleveland, Ohio.

Pile Hammers and Extractors

749 McKiernan-Terry pile hammers and pile extractors, hoists, derricks, whirlers and special bridge machinery are described in literature which McKiernan-Terry Corp., 19 Park Row, New York City will send on request.

Proposed Lighting for 100 Miles of N. Y. Roads

One of the most important findings of the New York State Joint Legislative Committee in its survey of road and traffic conditions was the matter of adequate highway illumination obviously necessitated by the increasing number of accidents at night.

Some specific practical suggestions have been made to the Committee which appear to have great value. Eighty per cent of all operation of motor vehicles occurs during daylight hours, but 50 per cent of all fatal accidents occur after sunset. A study made by the State Bar Association shows that between the years 1927 and 1933 there was an increase of 13 per cent in accidents occurring during the daytime and an increase of 26 per cent in night accidents. During these years there was no increase in day accidents resulting in fatalities but an increase of 55 per cent in fatal accidents occurring at night.

The obvious answer to the problem is improved street and highway illumination, especially on main highways and highways leading into cities where traffic is congested and where the headlights of automobiles tend to confuse rather than aid the driver. There is no part of automobile equipment on which less improvement has been made than the headlights. This is not strange because to illuminate the road from the vehicle itself is wrong in principle and has proved ineffective. Adequate highway lighting is now a matter which can not be overlooked or disregarded in the search for highway safety.

The Committee therefore recommends that the Department of Public Works be given authority to establish and maintain highway illumination on not more than 100 miles of highway at such points as the Department believes would afford the best test of the effectiveness of the lighting, and also of the cost. The Committee feels that this is an extremely important subject and that lights should actually be installed at key locations by the Department of Public Works in order that the Legislature and the Department may have results of actual experience in determining future policy.

Besides the officers and members of the Senate and Assembly who were appointed members of this Committee when it was formed two years ago, the Committee also includes the Superintendent of Public Works, the Commissioner of Highways and representatives of the agricultural interests, cities and automobile industry.

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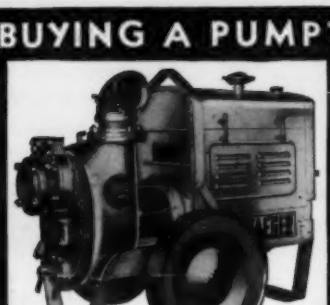

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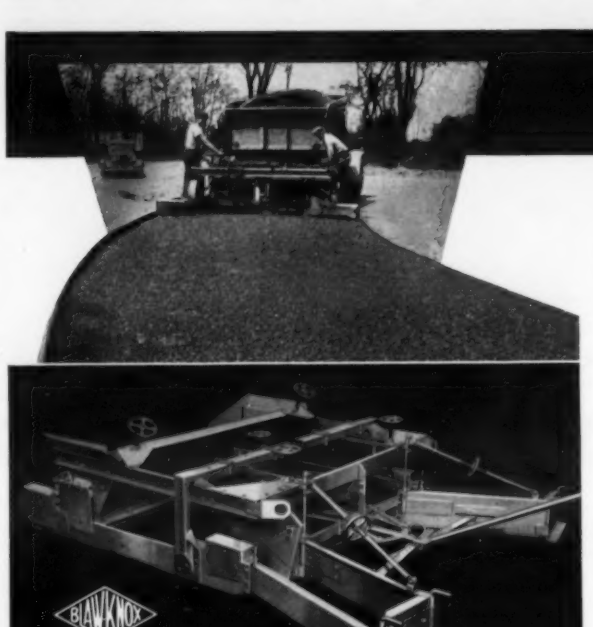

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QUICKWAY—Truck Shovels, Cranes
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GORMAN-RUPP—Self Priming Centrifugal Pumps
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M & M Form Clamps
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SAUERMAN—Cableways, Power Scrapers
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SULLIVAN—Air Compressors, Tools
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Hercules Road Rollers
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Hauck Heaters and Thawers
Johnson Bins and Hoppers
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Link-Belt Cranes, Shovels
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Diamond Gravel Crushing, Screening, Washing Plants, Conveyors
Killefer Scrapers, Road Discs, Rippers
Davey Air Compressors
Cleveland Rock Drills
Lenhart Wagons
Ames Baldwin Wyoming Hand Shovels
Blaw-Knox Ateco Scrapers, Bulldozers
Hanson Gas Shovels, Trirs.
Williamette-Erstad Hoists and Winches
Wausau Tractor and Truck Snow Plows
Davenport Gas and Diesel Locomotives
Oshkosh 4-Whl. Drive Trucks
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SMITH Concrete Mixers
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PARSONS Trenching Machines, etc.
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KWIK-MIX Mixers
RIDDELL Power Grader
JOHNSON Batchers and Demountable Bins
TRACKSON Loaders and Cranes
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LIDGERWOOD Hoists
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METAL FORMS CORP. Steel Forms
ROSCO Trailers and Bituminous Distributors
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Lidgerwood Mfg. Co.
Littleford Bros.
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Union Iron Works, Inc.
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Hauck—Heaters
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Skilsaw—Electric Saws, Drills
Skelton—Shovels
LeRoi—Engines
Symons—Column Clamps
Winslow—Weighing Scales
Universal—Form Clamps
Link-Belt—Cranes, Shovels, Draglines
Novo—Pumps
Vulcan—Steam and Drop Hammers
Waukesha—Engines
Mall—Vibrators and Grinders
Archer—Tower Equipment
Red Star—Wheelbarrows and Shorts
Templeton, Kenly & Co.—Trench Braces, Jacks
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Buffalo-Springfield Road Rollers
D-A Lubricants, Oils
Hewitt Belting, Hose
Le Tourneau Dirt Moving, Road Bldg. Equip.
Kohler Lighting Plants
LaCrosse Tu-Way Trailers
Hough-Universal Road Sweepers
Standard Paving and Plant-Mix Oiling Plants, Distributors, Trailer Oilers and Retorts
Leschen's Wire Rope
Homestead Hypressure Jenny

Tractor-operated Hoists, Scrapers, Dirtmovers, Rippers, Scarifiers, Bulldozers, Trailbuilders, Backfillers, Snow Plows, Loaders, Track-type and Wheeled Wagons and Trailers, etc.

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Butler Bin Co.
Chain Belt Co.
Cleaver-Brooks Co.
Coffing Hoist Co.
Columbia Steel Casting Co.
E. D. Etnyre & Co., Inc.
Elgin Corporation
Euclid Road Machy. Co.
Foote Company
Galion Iron Wks. & Mfg. Co.
Gardner-Denver Co.
Goodyear Tire & Rubber Co.
Jos. F. Klesler Co.
Hansen Trailers
Hazard Wire Rope Co.
Madsen Iron Works
Marmon-Herrington Co.
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Novo Engine Co.
Ohio Valley Pulley Works
Portable Machinery Co.
Ramsey Winches
Rotary Snow Plow Co.
Sauerman Bros., Inc.
Thew Shovel Company
Timken Roller Bearing Co.
Willett Mfg. Co.

Member: Associated Equipment Distributors

JOHNSON & DEALAMAN, INC.

60 Marshall Street Newark, N. J.

Representing

RANSOME Pavers, Mixers, Chuting Equipment
SCHRAMM Air Compressors, Tools
ALLIS-CHALMERS Tractors, Graders
JOHNSON Steel Bins and Batchers
ERIE Gasoline Rollers
MARLOW Centrifugal, Diaphragm and Plunger Pumps
ETNYRE Tar and Asphalt Distributors
WILLIAMS Trailers and Buckets
RED STAR Wheelbarrows, Batch Boxes, Column Clamps and Adjustable Shores
OSGOOD Shovels, Cranes and Draglines
GENERAL Shovels, Cranes and Draglines
HOTCHKISS Road and Sidewalk Forms
VIBRO-CAST & JACKSON Concrete Vibrators and Elec. Power Plants
AMERICAN Snow Plows
HY-WAY Spreaders

CONTRACTORS WHITE SALES CORP.

Wolfert Ave. at Broadway, Albany, N.Y.

Representing

White Motor Co.—Trucks and Buses
Allis-Chalmers Mfg. Co.—Tractors, Road Machy.
Jaeger Machine Co.
General Excavator Co.
Link-Belt Co.
Baker Mfg. Co., Inc.
Huber Mfg. Co.
Hough Universal Sweepers
Main Steel Products Co.
Pioneer Gravel Eq. Mfg. Co.

DOW & COMPANY, INC.

Court & Wilkeson Sts., Buffalo, N.Y.

Exclusive Distributors of

ADAMS—Leaning Wheel Graders
BARCO—Gasoline Hammers
BURCH—Spreaders, Maintainers, etc.
C. H. & E.—Pumps, Hoists, Saw Rigs
CHICAGO PNEUMATIC TOOL CO.—Compressors, Drills
EUCLID—Earth-Moving Equipment
FRINK—Sno Plows
HOUGH-UNIVERSAL—Sweepers
McCORMICK-DEERING—Tractors
"METAFORMS"—Concrete Forms
MOHAWK—"Hotstuf" Kettles, Burners
T. L. SMITH—Mixers, Pavers, Tower Pavers
THEW-LORAIN—Shovels, Cranes
TONCAN—Corrugated Culverts
UNIVERSAL-LORAIN—Shovels, Truck Cranes
WALTER—Snowfighters, Tractor Trucks
"WILLIAMS"—Buckets, Trailers
WILLIAMSPORT—Wire Rope

Member: Associated Equipment Distributors

LLOYD G. ROSS

3090 Main St. Buffalo, N. Y.

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Hercules Roller Co.

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116 John Street Horseheads, N. Y.

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A-W—Traffic Tread
BAKER—Road Drags, Snow Plows
C. M. C.—Wonder & Marsh-Capron Mixers
HUBER—Rollers
HOTCHKISS—Sidewalk Forms
HANSON—Excavators
INGERSOLL-RAND—Air Compressors
JACKSON—Wheelbarrows
MILES—Concrete Block Machines
THE NORTHERN—Gravel & Coal Conveyors
WILLIAMSPORT—Wire Rope
WISCONSIN SPECIAL—Snow Plows

JOHN R. TINKLEPAUGH

LIVINGSTON NEW YORK

also

924 Central Avenue, Albany, N.Y.

Representing

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Gar Wood Industries, Inc.
York Modern Corporation
Oshkosh Motor Truck Mfg. Co.
Euclid Road Machy. Co.
Killefer Mfg. Co.
Main Steel Products Co.

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Long Island City New York

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HUMPHREYS MFG. CO.—Diaphram, Plunger and Centrifugal Pumps
LEACH CO.—Concrete Mixers
INGERSOLL-RAND CO.—Air Compressors
COMPLETE—Wellpoint Systems
KADCO CORP.—Dust Control Equipment
RENTAL SERVICE

Member: Associated Equipment Distributors

GEORGE MALVESE & CO.

New Hyde Park, N. Y.

Long Island Distributors:

CLETRAC Crawler Tractors
"SILVER KING" Tractors
ADAMS Graders
SARGENT Snow Plows
LOCKE Power Mowers
REX Pumps, Mixers
EUCLID Scrapers
OLIVER Implements
BRODERICK & BASCOM Wire Rope

WORTHINGTON Power Mowers

"Brooks for Concrete Equipment"

R. E. BROOKS COMPANY

Equipment for Contractors

50 Church Street New York, N.Y.

Blaw-Knox Co.—Road and Sidewalk Forms, Bins, Batchers, Finishing Machines, Spreaders, Buckets
Cleaver-Brooks Co.—"OILBILT" Boilers, Tank Car Heaters
Insley Mfg. Co.—Excavators, Concrete Chuting Plants, Buckets, Cars
Kochring Company—Pavers, Mixers, Shovels, Cranes, Mud Jacks
Kwik-Mix Mfg. Co.—Concr. Mixers
Master Vibrator Co.—Concr. Vibrators
Parsons Co.—Trench Machines
Rosco Mfg. Co.—Oil Distributors

A. P. DIENST CO., Inc.

Contractors' Supplies

140th St. & 3rd Ave., New York, N. Y.

Distributors for

GREDAG Grease
TOLEDO Bull Frog Wheelbarrows
WYOMING Red Edge Shovels
DUFF Sewer Trench Braces
CURRY Wire Ties
KEYSTONE Grease

Telephone MOtt Haven 9-5430

MAHONEY-CLARKE, INC.

Complete Line of Contractors' Equipment and Supplies.

217 Pearl Street New York, N.Y.

Representing

Riddell Graders
Hercules Road Rollers
Schramm Compressors
Marlow Self-Priming Pumps
Munsell Pneumatic Concr. Vibrators
Osgood Shovels, Cranes, etc.
Cleveland Rock Drills, Pneu. Tools
Thurston Detachable Bits
Vulcan Pile Hammers, Extractors, Parts
Wiley Concrete Buckets

Rental Service

H. O. PENN MACHY. CO., INC.

140th St. & East River Bronx, N. Y.

Representing

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LaPLANT-CHOATE MFG. CO.
ATHEY TRUSS WHEEL CO.
BLAW-KNOX Dirt-Moving Eq.
R. G. LeTOURNEAU, INC.
MARION Shovels, ¾-2 yds.
SPEEDER Shovels, ½-⅝ yd.
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SMITH Mixers, Pavers
LeROI Compressors, Engines
HELTZEL Steel Bins, Forms
FRINK Sno Plows
MARLOW Pumps
KIESLER Buckets

Warehouse Stock—Service Station

Member: Associated Equipment Distributors

JOHN REINER & CO., Inc.

29 Howard St. New York, N. Y.

Representing

NOVO ENGINE CO.—Gasoline Engines
WISCONSIN MOTOR CORP.—Gasoline Engines and Power Units
PERFEX RADIATOR CO.—Radiators
STOVER MFG. & ENGINE CO.—Diesel Engines, Generating Sets
TWIN DISC CLUTCH CO.—Clutches

Telephone CAnal 6-0286

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165 Locust Avenue
NEW YORK, N. Y.

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Construction Machinery Co.
White Mfg. Co.

Member: Associated Equipment Distributors

N. P. WALTON, JR.

39 Cortlandt Street New York,

Representing

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D. C. ELPHINSTONE, INC.—"BEST" and Chip Spreaders
ERIE STEEL CONSTRUCTION CO.—All Bins, Complete Aggremeter Plants, Buckets, Clamshell, Dragline and Electr
IOWA MFG. CO.—"CEDAR RAPIDS" C ers, Material Handl. Equip.; Sand, Grave Asphalt Plants
THE KRON CO.—Full-capacity Springless Scales
HANDY SACK BALER CO.—Cement Cleaners, Balers

BREWSTER & WILLIAMS,

Contractors' Supplies and Equipment

306 S. Salina St. Syracuse, N

Representing

AMERICAN HOIST Shovels, Cranes, Derricks, Ho
BUTLER Bins and Measuring Hoppers
C. H. & E. Contractors' Pumps, Hoists, Saw Rig
HAISS Loaders, Excavators, Conveyors and Bucke
HOTCHKISS Steel Forms
LITTLEFORD Asphalt Heaters and Tools
RANSOME Mixers, Pavers, Towers and Chutes
ROGERS Trailers
SULLIVAN Compressors, Drills and Hoists
WEHR Power Graders

Member: Associated Equipment Distri

THE SYRACUSE SUPPLY

314 W. Fayette St. Syracuse,
Warehouse 358 W. Jefferson S

Atlas Powder Co.
Barber-Greene Co.
Blaw-Knox Co.
Caterpillar Tractor Co.
Centaur Tractor Co.
Clyde Sales Co.
Goodyear Tire & Rubber Co.
Gorman-Rupp Co.
Goulds Pumps, Inc.
Hazard Wire Rope Co.
Ingersoll-Rand Co.
Johns-Manville (Bridge Plank)
Killefer Mfg. Co.
Kochring Co.
LaPlant-Choate Mfg.
Insley Mfg. Co.
Parsons Co.
Rumsey Pump Co.
Universal Form Cl
Wickwire Spencer Corp.
Williamsport Wire
Timken Roller Be Service & Sale Timken Bits & R
Iowa Mfg. Co.
H. G. LeTourneau,

Member: Associated Equipment Distri

NORTH CAROLINA EQ.

P.O. Drawer 426, 3116 Hillsboro S
RALEIGH, NORTH CAROLIN

Br. Off. & Warehouse—No. 1 Londo
Phone 411, Asheville, N. Car

American Cable Company
Aeroil Burner Company
Buckeye Traction Ditcher Company
Cleveland Rock Drill Co.
Continental Roll & Steel Foundry Co.
Day Pulverizer Company
Euclid Road Machy. Co.
The Four Wh. Dr. Auto Co.
Galion Iron Wks. & Mfg. Co.
Galion Allsteel Body Co.
Good Roads Mach. Corp.
Chas. Hvass & Company
Iowa Manufacturing Co.
Internat'l Harvester Co.
Jaeger-Lakewood C
Jeffrey Manufacturi
The C. S. Johnson Kensington Steel C
Kinney Manufactu
Jos. F. Klesler Co
Miami Trailer & Se
Michigan Power Sh
Northwest Engineer
Page Engineering
Rogers Brothers C
Schramm, Inc.
Waukesha Motor
Willett Manufactur
Wheeled Roller Co
Elgin Corporation

Member: Associated Equipment Distr

CAROLINA TRACTOR EQUIPMENT COMPA

S. Main Ext. Salisbury, N

Branch Office and Warehouse:
733-35 West Hargett St., Raleigh, N

ETNYRE—Bituminous Distributors, Flushers
GORMAN-RUPP—Centrifugal Pumps
CATERPILLAR—Tractors, Graders, Power Pla
BLAW-KNOX—Steel Forms, Bins, Buckets, T
BARBER-GREENE—Conveyors, Car Unloaders
DIAMOND—Roll, Jaw Crushers
HERCULES—Gas Road Rollers
LaPLANT-CHOATE—Wagons, Bulldozers
SLUSSER-MacLEAN—Wheelers, Rippers, Fres
THEW—Shovels, Cranes
WONDER—Mixers, Pumps, Hoists
GARDNER-DENVER—Air Compressors, Drills
LaCROSSE—Trailers
LeTOURNEAU—Carry-All Scrapers

Member: Associated Equipment Distr

THE BLAISDELL-FOL EQUIP. CO.

2143-2147 Barnard St. Cincinna

Representing

Allis-Chalmers Mfg. Co.—Tractors, Road Machi
Chain Belt Co.—Rex Pavers, Moto-Mixers, Build ers and Pumps
Northwest Engineering Co.—Gasoline Shovels, Draglines, Pull Shovels
Ingersoll-Rand Co.—Compressors, Pneumatic Too
Clyde Sales Co.—Hoisting Engines, Derricks
Dravo-Doyle Co.—American Tubular Towers
Sauerman Bros., Inc.—Cableways, Power Scrapers
Universal Crusher Co.—Crushers
The C. S. Johnson Co.—Bins, Batchers
Deister Machine Co.—Plat-O Vibrator Screens
Vulcan Iron Works—Pile Hammers
Wellman Engineering Co.—Clamshell, Dragline
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Member: Associated Equipment Dist

THE CLETRAC OHIO SALES

E. 193rd Street and Euclid A
Cleveland

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THE CLEVELAND TRACTOR CO.—
Tractors
THE DAVEY COMPRESSOR CO.—Al
Compressors
THE EUCLID ROAD MACHY. CO.—
Wagons, Scrapers
MAIN STEEL PRODUCTS CO.—Snow
D-A LUBRICANT CO.—Oil
THE ROC COMPANY—Winches

DALE & RANKIN, INC.

113 Frelinghuysen Ave., Newark, N. J.

Representing

HELTZEL Road Forms and Bins
P & H Cranes and Excavating Equipment
P & H Hansen Electric Arc Welders
INGERSOLL-RAND Compressors and Tools
STERLING Wheelbarrows
AEROIL Heaters and Tools
ALEMITE Guns and Fittings
REX Mixers and Pavers
REX Pumps
REX Saw Rigs
UNIVERSAL Concrete Accessories
VIBER Elec. & Pneu. Concrete Vibrators
WINSLOW Scales

Member: Associated Equipment Distributors

NORTHWEST EQUIP. CO., Inc.

Box 1112 Great Falls, Mont.

Complete Line of Road Machinery and Contractors' Equipment

Representing

PIONEER Gravel Equip.
KOEHRING Mixers, Pavers, Shovels
INSLEY Concr. Towers
PARSONS Ditchers
PANTHER Oil, Grease
COLEMAN Trucks
OWEN Buckets
SCHRAMM Air Compressors
MacWHYTE Rope
CLEVELAND Rock Drills

Steel Bridges and Traffic Trends, Fresnos, Plows, Scrapers, etc.

HEYNIGER BROTHERS

Contractors' Equipment

6th Ave. and F St. Belmar, N. J.

JAEGER Concrete Mixers
JAEGER Placing Plants
AEROIL Torches, Heaters

Steel Sidewalk and Curb Forms
"Mud Hog" Pumps
Material Elevators
Air Compressors
Gasoline Hoists
Trench Pumps
Carbic Lights
Wheelbarrows
Mortar Tubs
Steel Mortar Boxes
Picks and Shovels
Tarpaulins
Scaffold Horses
Electric Drills & Saws
Chain Hoists

LOOK THIS DIRECTORY OVER CAREFULLY

If you find any errors while checking over this directory will you please advise us, because it is our desire to keep it accurate and up to date at all times.

CONTRACTORS AND ENGINEERS MONTHLY

470 Fourth Avenue New York

HOWARD-COOPER CORPORATION

Portland — Seattle — Spokane — Twin Falls

Representing

Internat'l Harvester Co. (McCormick-Deering Industrial Tractors)
Barber-Greene Co.
Cleveland Rock Drill Co.
Marion Steam Shovel Co.
Hughes-Keenan Co.
Cleaver-Brooks Co.
The Jaeger Machine Co.
Nordberg Mfg. Co. (Symons Crushers)
McKiernan-Terry Corp.
Rotary Snow Plow Co.
Schramm, Inc. (Compressors)
Universal Power Shovel Co.
Buda Co. (Diesel & Gas. Eng.)
Baker Mfg. Co.
Walter Motor Truck Co.
Seagrave Corp.
B. F. Goodrich Rubber Co. (Fire Hose)
Winslow (Scales)
Hercules Company
Sterling Wheelbarrow Co.
Root Spring Scraper Co.
White Mfg. Co.
Erie Steel Const. Co.
Wheeled Roller Corp.
J. D. Adams Co.

Member: Associated Equipment Distributors

ALLEGHENY EQUIPMENT CORPORATION

P. O. Box 1888 Pittsburgh, Pa.

Distributors for

ALLIS-CHALMERS Tractors and Allied Tractor Equipment
GARDNER-DENVER Compressors and Drills
HERCULES Road Rollers
HOUGH "Universal" Road Sweepers
JACKSON Concrete Placement Vibrators
LINK-BELT Power Shovels and Cranes
MICHIGAN ⅜-yd. Truck and Crawler Shovels and Cranes

PHILLIPS MACHINERY CO.

900 East Cary St. Richmond, Va.

Representing

Austin Machinery Corp.
Clyde Sales Co.
Chicago Automatic Conveyor Co.
DeWalt Products Corp.
Erie Steel Construction Co.
Jackson Mfg. Co.
Sauerman Brothers, Inc.
Chicago Pneumatic Tool Co.
Stephens-Adamson Mfg. Co.
Rogers Brothers Corp.
General Excavator Co.
Aeroil Burner Co.
Manitowoc Engineering Works
Broderick & Bascom Rope Co.
Chain Belt Company
Van Dorn Electric Tool Co.
Also many other lines of Contractors' Equipment

Member: Associated Equipment Distributors

H. B. FULLER EQUIP. CO.

1836 Euclid Ave. Cleveland, Ohio

Representing

Blaw-Knox Company—Bins, Batches, Forms, Trukmixers, Buckets, ORD Finishing Machines, Asphalt Plants
Link-Belt Co.—Shovels, Cranes, Draglines, Locomotive Cranes
Ransome Concr. Machy. Co.—Pavers, Constr. Mixers, Towers and Chuting Equip.
Baldwin Locomotive Works (Internal Combustion Division—"Whitcomb Locomotives")—Gasoline, Diesel, Elec. and Storage Battery Locomotives
Electric Tamper & Equip. Co.—Concrete Vibrators, Elec. Tampers
Moritz-Bennett Corp.—Rd. Shoulder Finishers, Form Pullers
Concrete Surfacing Machinery Co.—"Berg" Surfacers
C. H. & E. Mfg. Co.—Pumps, Saw Rigs, Hoists, Mixers, etc.
Gruendler Crusher & Pulv. Co.—Hammer Mills, Shredders, Jaw Crushers, Screens, etc.

GASH-STULL CO.

Chester Pennsylvania

Representing

FORDSON Tractor and Equipment
UNIVERSAL POWER SHOVEL CO. Unit Shovels ⅜ to ½-yd.
OSGOOD Shovels—all types
WEHR CO.—Road Graders, all sizes
TRACKSON CO.—Crawler Wagons, Crawlers
MICHIGAN Power Shovels
SCHRAMM Compressors

LOCOMOTIVES
HOISTS — SCRAPERS — WIRE ROPE
MANGANESE DIPPER TEETH

WESTERN MATERIAL CO.

Aberdeen, Sioux Falls, Rapid City, S. D.

Ateco Dirt Moving Equip.
Barber-Greene Conveyors, Loaders, Ditchers
Bros Snow Plows, Rd. Bldrs.
Bucyrus-Erie Loadmaster "Caterpillar" Equipment
Chain Belt Mixers, Pumps
Cleaver-Brooks Tank Car Heaters
Clyde Hoists, Derricks
Day Crushers
Hough Sweepers
LaPlant-Choate Equipment
Lenhart Wagons
LeTourneau Road Equip.
Linn Tractor-Trucks
Littleford Bros. Equip.
M & M Wire Clamps
Pioneer Gravel Equip.
Philip Carey Elastite
St. Paul Bodies, Hoists
Schramm Air Compressors
Sterling Wheelbarrows, Carts
Stolle Stone Spreaders
Toro Mowers
Walter Motor Trucks
Wausau Snow Plows
Williamette-Hyster Hoists
Wood Shovels

Member: Associated Equipment Distributors

PACIFIC HOIST & DERRICK CO.

Machinery and Equipment

3200 4th So. Seattle, Wash

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BUHL—Air Compressors
TWIN DISC—Clutches for all purposes
PAGE—Scraper Buckets, Diesel Draglines
MINNEAPOLIS—"Twin City" Gas Engines
CLIMAX—Gasoline Engines
WISCONSIN—Gasoline Engines
MARMON-HERRINGTON—Trucks
DAKE ENGINE CO.
PIONEER—Gravel Equipment
ISAACSON IRON WORKS—Buckets
CLETRAC—Tractors

Member: Associated Equipment Distributors

INDUSTRIAL ENGINE PARTS, INC.

1053 E. 61st St. Cleveland, Ohio

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Climax Engineering Co. Twin Disc Clutch Co.
Fuller & Johnson Mfg. Co.
Wisconsin Motor Corp. (Air-Cooled)
Stover Engine & Mfg. Co.
Scintilla Magneto Co.
Wico Electric Co. Pierce-Governor Co.
Portable Power Tool Corp. Hercules-Servel, Inc.
LeRoi Co.

EDELEN & BOYER COMPANY

Office and Warehouse
236 North 23rd St. Philadelphia Penna.

Distributors of

Osgood Shovels, Cranes
General Shovels, Cranes
Multi Foote Pavers
Adsun Black Top Pavers
Heltzel Steel Forms, Bins
Heltzel Finishing Mach.
Marsh Capron Mixers
Wonder Concrete Mixers
Marlow Centrifugal Pumps
Marlow Diaphragm Pumps
Chrysler Portable Air Compressors
New Haven Burlapped-Cotton Blankets
Hayward Clamshell Buckets
Huber Rollers
Archer Towers, Buckets
LaCrosse Tu-way Trailers
Bursh Stone Spreaders
Saugen Derricks, etc.
Fiory Hoists
H-B Power Subgrader
Miles Block Machines
Pulsometer Steam Pumps
Bay City Truck Cranes
Reynolds Constr. Furnaces
Jackson Wheelbarrows, etc.

NIXON-HASSELLE COMPANY INC.

Contractors' Equipment
Chattanooga Tennessee

Representing

BLAW-KNOX Buckets, Forms
INGERSOLL-RAND Compressors
MUNDY Hoists
AUSTIN-WESTERN Graders, Crushers, Rollers, etc.
BARBER-GREENE Loaders, Conveyors
NORTHWEST Cranes, Shovels
HOMESTEAD Hypressure Jenny
EASTON Dump Bodies, Cars, Track
TRACKSON Tracks, Cranes
ARCHER Towers, Spouting Equipment
REX Mixers, Pavers, Pumps
CLETRAC Tractors
NEWPORT Culvert Pipe
VULCAN Gasoline Locomotives
DOBBIE Derricks
HOUGH—"Universal" Road Sweeper

Also Wheelbarrows, Carts, Benders, Cutters, Shovels, etc.

Member: Associated Equipment Distributors

CONSTRUCTION EQUIPMENT CO.

1118-1124 Ide Ave., Spokane, Wash.

Aeroil Burner Co.
Archer Iron Works
Beebe Bros.
Blystone Mfg. Co.
Broderick & Bascom Rope Co.
Buffalo-Spgfld. Roller Co.
Butler Bin Co.
Chain Belt Co.
Climax Eng. Co.
D-A Lubricant Co.
Detroit Graphite Co.
DeWalt Products Co.
Elgin Sales Corp.
Fairbanks, Morse & Co.
Fate-Root-Heath Co.
Garso Manufacturing Co.
Homestead Valve Mfg. Co.
Kalamazoo Ry. Supply Co.
LeRoi Co.
Linde Air Products Co.
M. & M. Wire Clamp Co.
Niagara Mfg. Co.
Novo Engine Co.
Oshkosh Motor Truck Co.
Bates Valve Bag Corp. (Wire Ties)
Saugen Derrick Co.
Sheldon Mfg. Co.
Sterling Wheelbarrow Co.
Sullivan Machy. Co.
Symington Gould Corp.
Templeton, Kenly & Co.
Thew Shovel Co.
Williamette-Ersted Co.
"Williams" Buckets & Trailers
Young Iron Works

Member: Associated Equipment Distributors

W. T. WALSH EQUIPMENT CO.

3088 West 106th St., Cleveland, Ohio. Tel. Clearwater 4400

Barco Mfg. Co.—Gasoline Hammers
Bennet Company—Crushers
Cleveland Rock Drill Co.—Air Tools
Diamond Iron Works—Crusher Plants
The C. S. Johnston Co.
Foote Company—Pavers
General Excavator Co.—Shovels
Hough-Universal—Sweepers
Huber Mfg. Co.—Rollers
White Mfg. Co.—Asphalt Plants, Tar Kettles, Kerosene Torches, Concr. Vibrators
McKiernan-Terry Corp.—Pile Hammers
Michigan—Power Shovels
Novo Engine Co.—Engines, Light Plants
Roseo Mfg. Co.—Rosco Distributors & Oilers
Rome—Graders
Schramm, Inc.—Air Compressors
Timken—Bits
Viber Co., Ltd.—Concrete Vibrators
Wellman Engineering Co.—"Williams" Buckets
Allis-Chalmers—Tractors
Construction Machy. Co.—Mixers

Member: Associated Equipment Distributors

GILES & RANSOME

17th St. & Sedgley Ave., Philadelphia

RANSOME CONCRETE MACHINERY CO.—Concrete Mixers and Appliances
BLAW-KNOX CO.—Clam-shell Buckets, Steel Forms, Steel Buildings, Steel Bins.
CATERPILLAR TRACTOR CO.—Tractors and Road Machinery
RICHMOND SCREW ANCHOR CO.—Concrete Specialties
THE BARNES MFG. CO.—Centrifugal Diaphragm and Force Pumps
NORTHWEST ENGINEERING CO.—Gasoline Cranes and Shovels
ORD—Road Finishing Machine
CLYDE—Hoisting Engines and Derricks

Member: Associated Equipment Distributors

BROOKS-PAYNE-OSBORNE EQUIPMENT CO.

Knoxville 408 Davenport Rd. Tennessee

Representing

Bucyrus-Erie Co.—Shovels, Cranes, Draglines
International Harvester Co.—Crawler, Tractors
J. D. Adams Co.—Road Machinery
Gardner-Denver Co.—Compressors, Drills
Cruelble Steel Co.—Detachable Bits
Heltzel Steel Form & Iron Co.—Bins, Batchers
Chas. Hvass & Co., Inc.—Distributors
Continental Roll & Steel Co.—Wooldridge Trailbuilders
Jaeger Machine Co. } Mixers, Concrete
Lakewood Engineering Co. } Handling Equipment
Linn Manufacturing Corp.—Linn Tractors
Pioneer Gravel Eq. Mfg. Co.—Crushing, Screening Plants
Hewitt Rubber Corp.—Hose and Belts
Georgia-Carolina Oil Co.—Tractor Lubricants
Independent Pneumatic Tool Co.—Pneu. & Elec. Tools
Taylor-Wharton Iron & Steel Co.—Steel Castings

Member: Associated Equipment Distributors

BOEHCK EQUIPMENT CO.

2404 W. Clybourn St. Milwaukee, Wis.

Representing

Barber-Greene Co.
Jaeger Machine Co.
Byers Machine Co.
LeRoi Co.
A. Leschen & Sons Rope Co.
Wellman Engineering Co.
W. Toepfer & Sons Co.
Heltzel Steel Form & Iron Co.
Flexible Road Joint Mach. Co.
McKiernan-Terry Co.
Homestead Valve Mfg. Co.
Saugen Derrick Co.
American Hoist & Derrick Co.
Richmond Screw Anchor Co.
Trackson Co.
Jones-Superior Machine Co.
Fairbanks, Morse & Co.
Youngstown Pressed Steel Co.
Independent Pneumatic Tool Co.
Greenlee Tool Co.
Production Equipment Co.
Hetherington & Berner Co. Inc.

Member: Associated Equipment Distributors

J. C. HOUSTON

30 Church Street New York, N.Y.

Representing

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HOISTING MACHINERY CO.

Warehouse

ELIZABETH, N.J.—L.V. R.R.

HOWARD W. READ CORP.

800 N. Delaware Ave., Philadelphia, Pa.

Distributors

Koehring Co.
Ingersoll-Rand Co.
Pomona Pump Co.
Gorman-Rupp Co.
Iowa Mfg. Co.
Wm. Bros Boiler & Mfg. Co.
Galion Iron Works & Mfg. Co.
Metal Forms Co.
Quick-Way Truck Shovel Mfg. Co.

Also Carry in Stock:

Hoisting Engines, Gas and Steam
Pile Driving Hammers
Truck Cranes

WILSON-WEESNER-WILKINSON CO.

Nashville Tennessee

Representing

Koehring Co.
Insley Mfg. Co.
Allis-Chalmers Mfg. Co.
Blaw-Knox Co.
C. H. & E. Mfg. Co.
Gorman-Rupp Co.
The Parsons Co.
T. L. Smith Co.
Ingersoll-Rand Co.
Littleford Bros.
McKiernan-Terry Corp.
Smith Engineering Works
American Hoist & Derrick Co.
Rock Mfg. Co.
Ames Baldwin Wyoming Co.
Baker Mfg. Co.
Cleaver-Brooks Co.

NASHVILLE—KNOXVILLE
Warehouse Stocks of Service
Reinforcing Steel and Mesh

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SAUERMAN Cableways
"RED STAR" Wheelbarrows
BATES Wire Ties
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Contractors and Engineers Monthly

Rudy Arnold Photo

Raising the 2,200-Ton Lift-Span of the Triborough Bridge, N.Y.C., into Final Position. See Page 9.

C. & E. M. Photo

Above, the Forms Placed on a Foundation of Hot-Mix Material to Insure Stability and Prevent Waviness When the Heavy Finishing Machine Ran Along the Forms on the Republic Asphalt Paving Co.'s Contract on the Dayton-Lebanon Road in Ohio.

C. & E. M. Photo

A "Comfy-Rest" Timber Mattress for the Bed of the Missouri River. See Page 1.

C. & E. M. Photo

Left, Delivering the Hot-Mix to the Sheet Metal Dumping Board for Hand Spreading and Machine Finishing. Insulated Trucks Hauled the Material 14 Miles from the Contractor's Own Plant in Dayton. See Page 5.

Trees and Shrubs Along the Highway Are Carefully Protected from Injury During the Burning of Weeds Along Roadsides in California. This Program Has Greatly Decreased the Fire Hazard Along 1,100 Miles of State Roads. See Page 15.

An Island in the Willamette River, Oregon, Is Pulled to Shore by Slackline Cableway Scrapers to Repair the Badly Eroded Banks, Shown in the Foreground. See Page 22.

Day and Night Scenes Along Washington State Route 1. The Sodium Vapor Lights Have Proved Very Successful, Even in Dense Fog. See Page 1.